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JUNE 1945

PUBLISHED MONTHLY BY AMERICAN MEDICAL ASSOCIATION, 535 NORTH DEARBORN STREET, CHICAGO 10, ILLINOIS. ANNUAL SUBSCRIPTION, $6.00

Entered as Second Class Matter Jan. 14, 1925, at the Postoffice at Chicago, Under the Act of Congress of March 3, 1879

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VOLUME 41 JUNE 1945 NUMBER 6

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AN ANALYSIS OF COLDS IN INDUSTRY

JOSEPH H. KLER, M.D.
NEW BRUNSWICK, N. J.

The common cold as a disease has only a moderate appeal to the otolaryngologist in practice. However, as a health problem it is the concern of all physicians. It is the only ailment that affects virtually every one each year. There is no time of the year when the community is entirely free of colds. The mode of life in the cities is conducive to its spread, for, in spite of advances in ventilation, there are still crowded conditions in schools, factories and offices. In spite of the fact that colds have been known since early times, physicians still have little actual scientific knowledge of their exact cause, their prevention and cure. In general, the results in the treatment of colds are not brilliant. The cold persists in being a complex problem, and

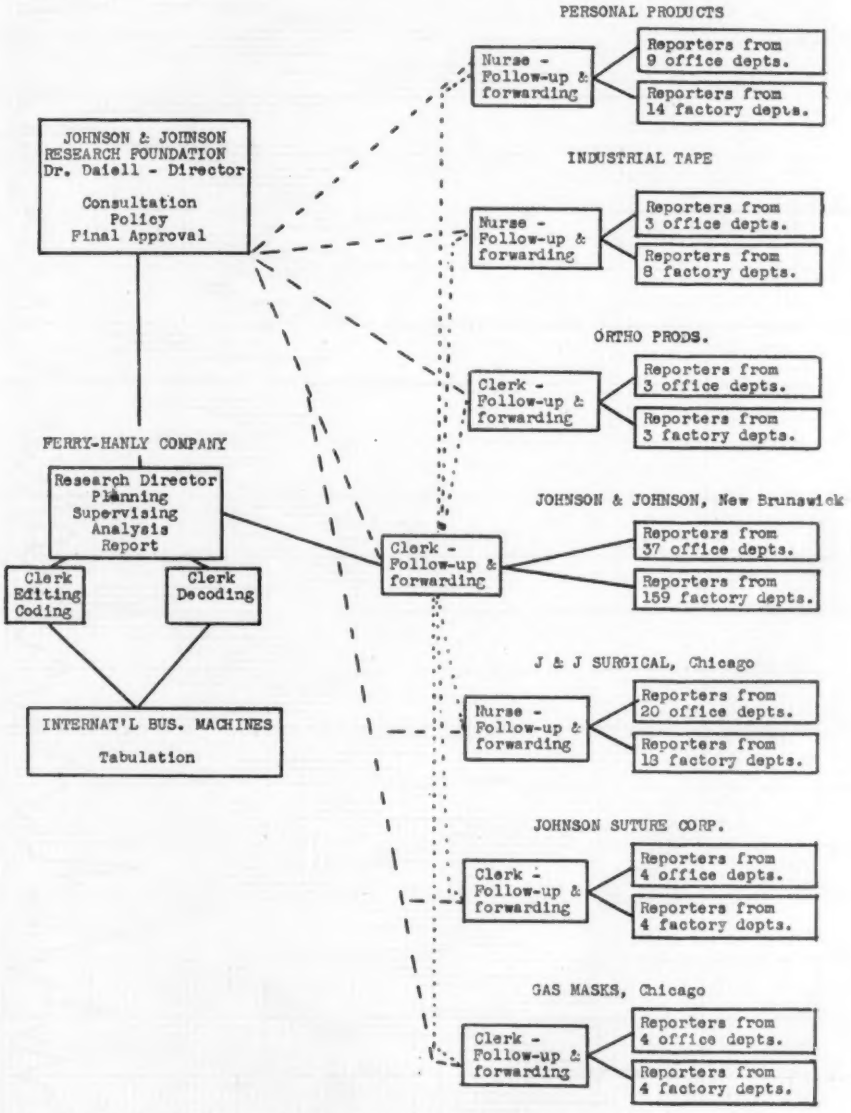
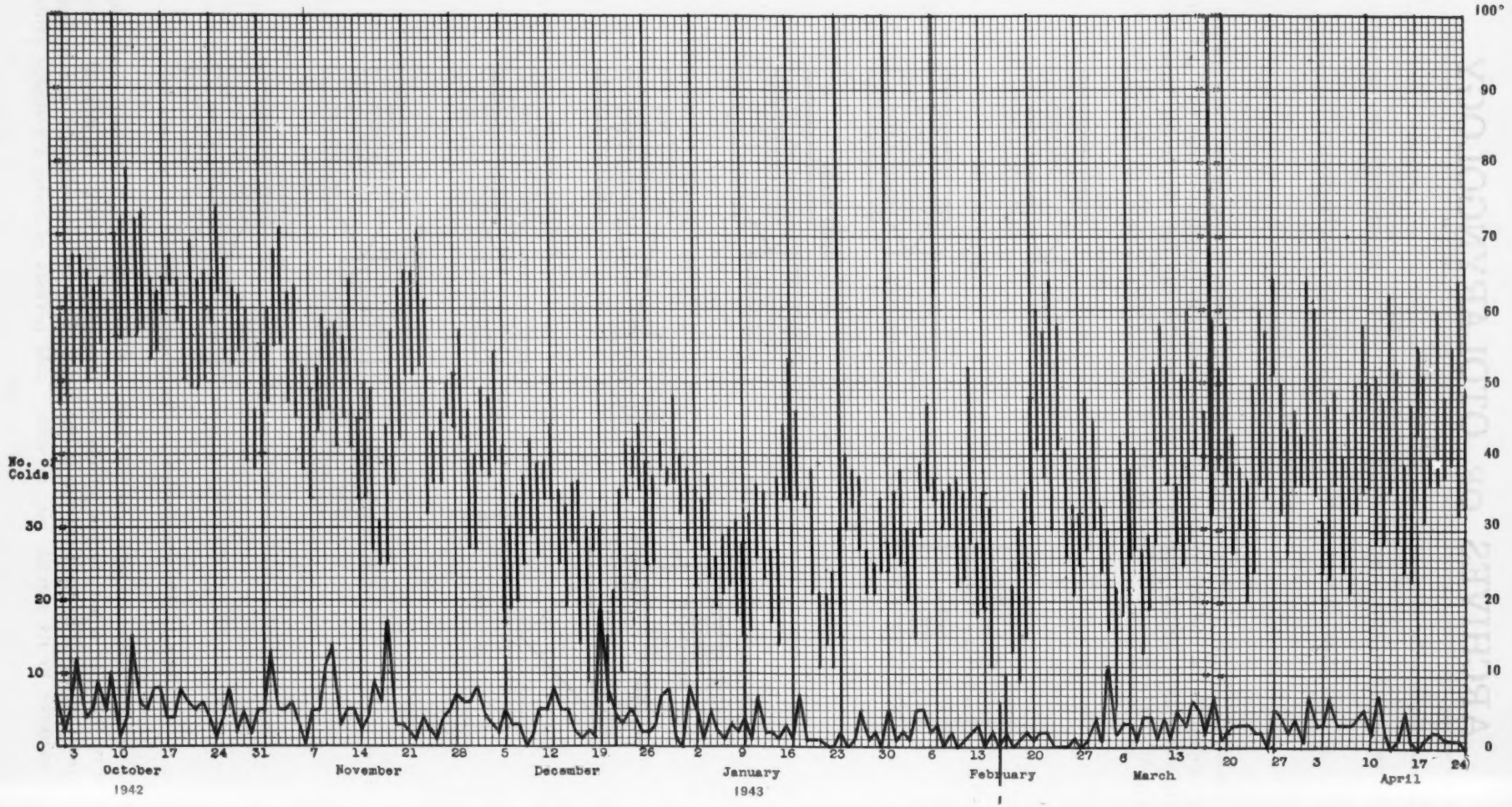


Chart 1.—The organization and the mode of operation of the study.


No. of Colds
0
10
20
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50
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30
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3 10 17 24 31 7 14 21 28 5 12 19 26 2 9 16 23 30 6 13 20 27 6 13 20 27 3 10 17 24
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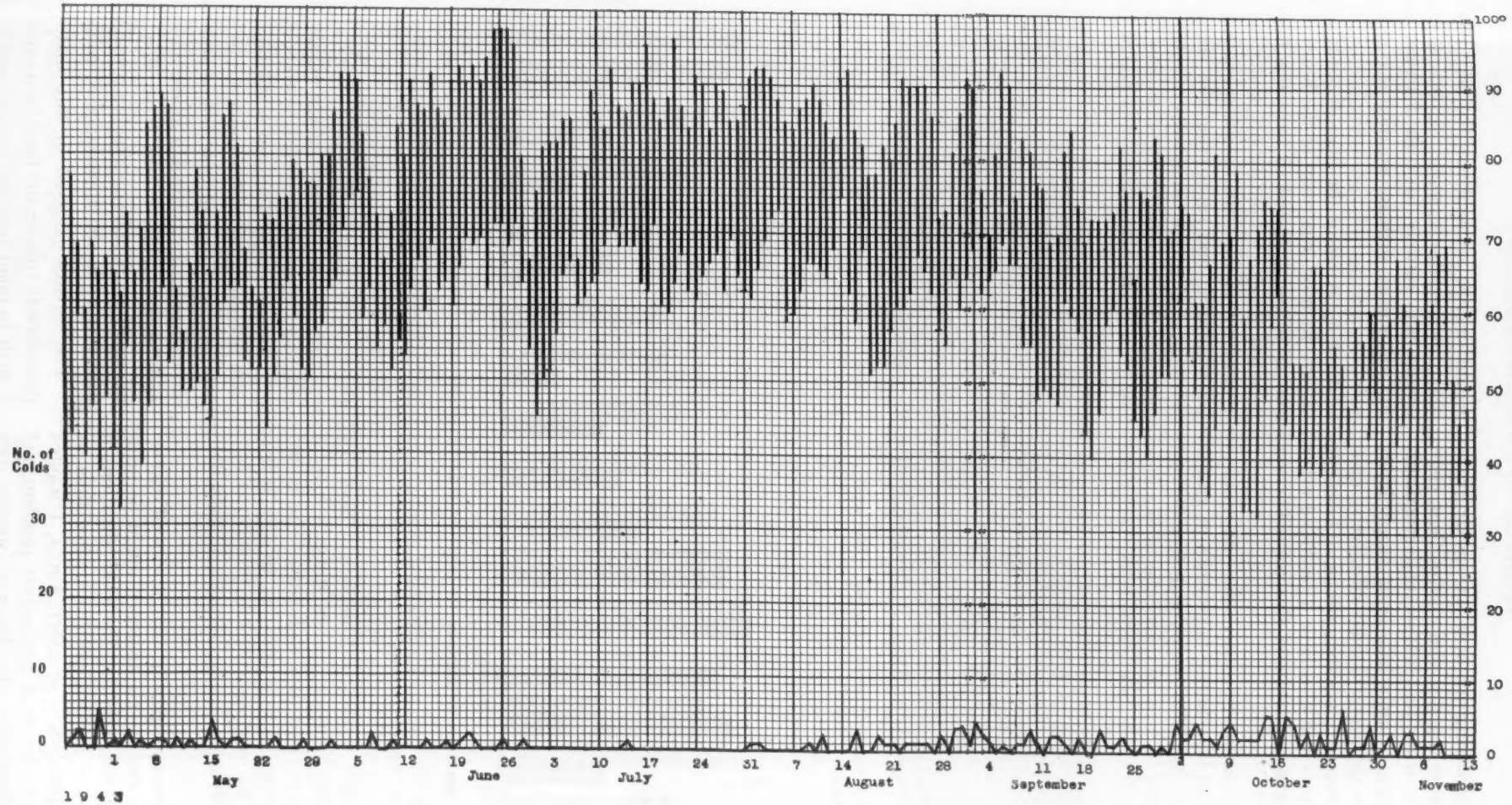

Chart 2.—Correlation of daily temperature and onset of colds in the New Jersey plant. The upper part of the chart shows the temperature and the lower part the curve for colds. The number of colds is indicated by the figures at the left; the temperature, by the figures at the right.

it persists in having frequent serious complications. Because the vast majority of these complications occur in the field of otolaryngology, otolaryngologists cannot help being deeply interested. Once they control colds effectively, sinusitis will become a rare disease. Effective control of colds will also have a profound effect on the reduction of deafness due to middle ear disease.

Although universal in scope, the cold problem can be studied best among large resident groups —schools, institutions, camps and, last but not least, industry. It is of particular importance in industry. Colds are responsible for more

would first be accumulated and then correlated and interpretations made. The information sought was entirely basic in character, and my knowledge such information was not available.

After a review of the plan of study, General R. W. Johnson, chairman of the board of Johnson & Johnson, agreed to have the Johnson & Johnson Research Foundation, under the direction of Dr. H. L. Daiell, assist me in this study by organizing and supervising the procurement of data among the employees of the various plants of the company located in the East and Midwest. The cold survey was planned in two

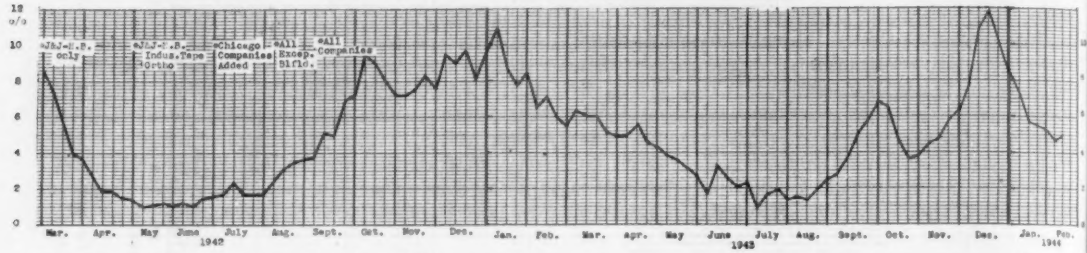

Chart 3.—Seasonal trend of colds: The weekly percentage of employees having colds in Johnson & Johnson and subsidiaries.

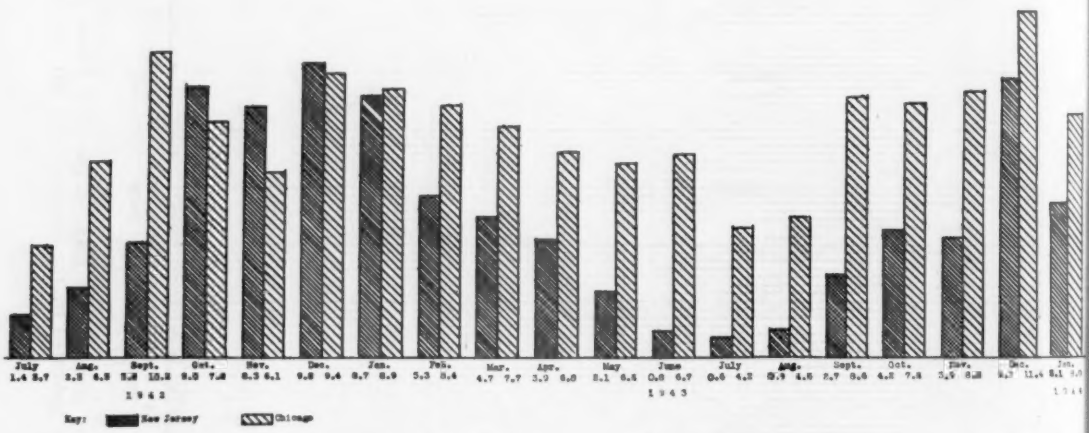

Chart 4.—Average weekly percentage of colds in New Jersey (heavily cross-hatched columns) and in Chicago (lightly cross-hatched columns).

than one third of the total number of days lost in American industry. They cause a loss of 100 million working days each year. The annual cost of these colds is one half to two billion dollars. The magnitude of this problem is adequate justification for a thorough investigation of it.

With these thoughts in mind, it seemed reasonable to me that a new approach might be helpful. Why not appraise the cold situation in industry as a general problem rather than as a disease problem? In other words, I wanted to approach this as a production problem and study it objectively. In this way, specific data

parts—first, a general census of the incidence of colds among the employees as affected by age, sex, type of work, shift and surrounding physical conditions of heating and ventilation, together with a correlation of the influence of such outside factors as time of year, temperature, humidity and epidemics; second, a follow-up of patients with severe colds, in the hope that sufficient information might be obtained to reveal the dominant factors in the appearance of colds.

The reports gathered in this study attained considerable volume and have been carefully filed. I wish to point out that reports and tabulations

ere made week by week during the entire two ears of this study. Chart 1 gives graphically he organization and the mode of operation of his study. It is to be noted that the informaion was obtained from the employees in all stances.

of incidence are in December and in October, with that in December being the highest. The low point of incidence is in July.

Geographic Influence.—The incidence of colds was consistently higher in Chicago than in the East, especially during the summer months.

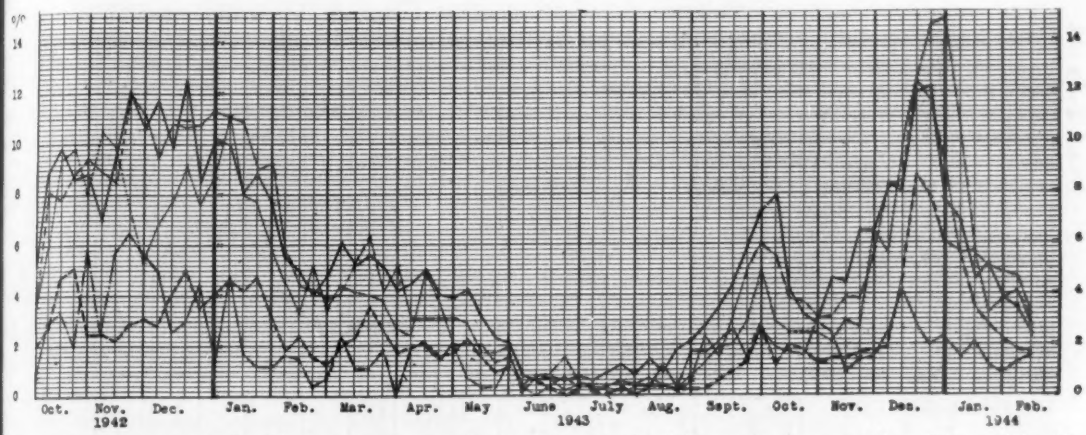

Chart 5.—Percentage of colds by age groups in the Johnson & Johnson factory at New Brunswick, N. J. he curves of incidence for the different groups are: Under 20 years (— — —); 20 to 29 years (——); 30 to years (- - -); 40 to 49 years (.....); over 50 years (— — —).

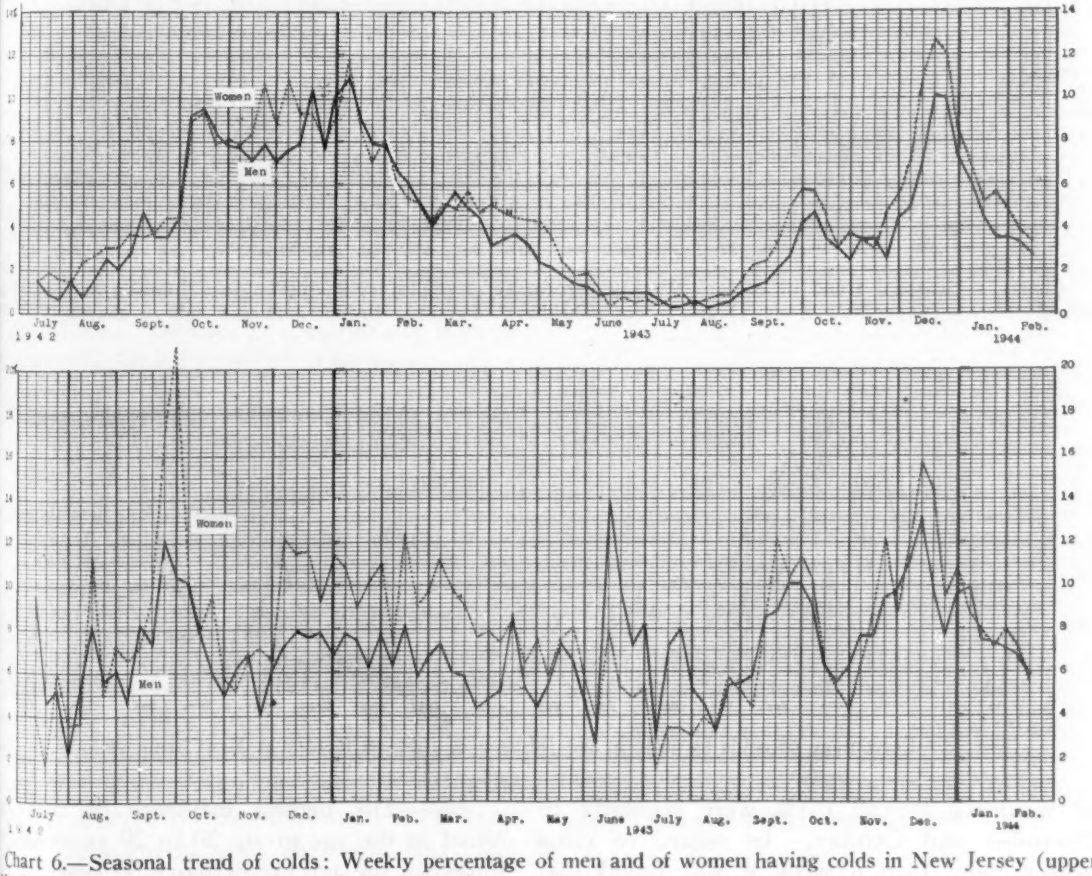

Chart 6.—Seasonal trend of colds: Weekly percentage of men and of women having colds in New Jersey (upper alf of chart) and in Chicago (lower half of chart).

DATA FROM THE GENERAL CENSUS

Incidence.—Colds have a definite cycle of ncidence as illustrated in chart 3. The peaks

Temperature.—There is a definite correlation between temperature and the onset of colds. As seen in chart 2, every sudden drop in tempera-

ture is followed in a day or two by a rise in the incidence of colds. This is more apparent when the comparison is made on a daily rather than on a weekly basis.

Season.—No marked correlation with season is evident in the two years of this study. Peaks of incidence for all colds were regularly in December and October. In regard to colds lasting more than a week it was found that the duration was unaffected by seasonal changes, the median number of days being twelve. There was one exception. The percentage of colds running over three weeks was much higher in the winter months (June to September, 8.5 per cent; October to January, 16.5 per cent).

Humidity.—Recordings of humidity were instituted late in this study, and we did not secure sufficient data to determine correlations or express an opinion.

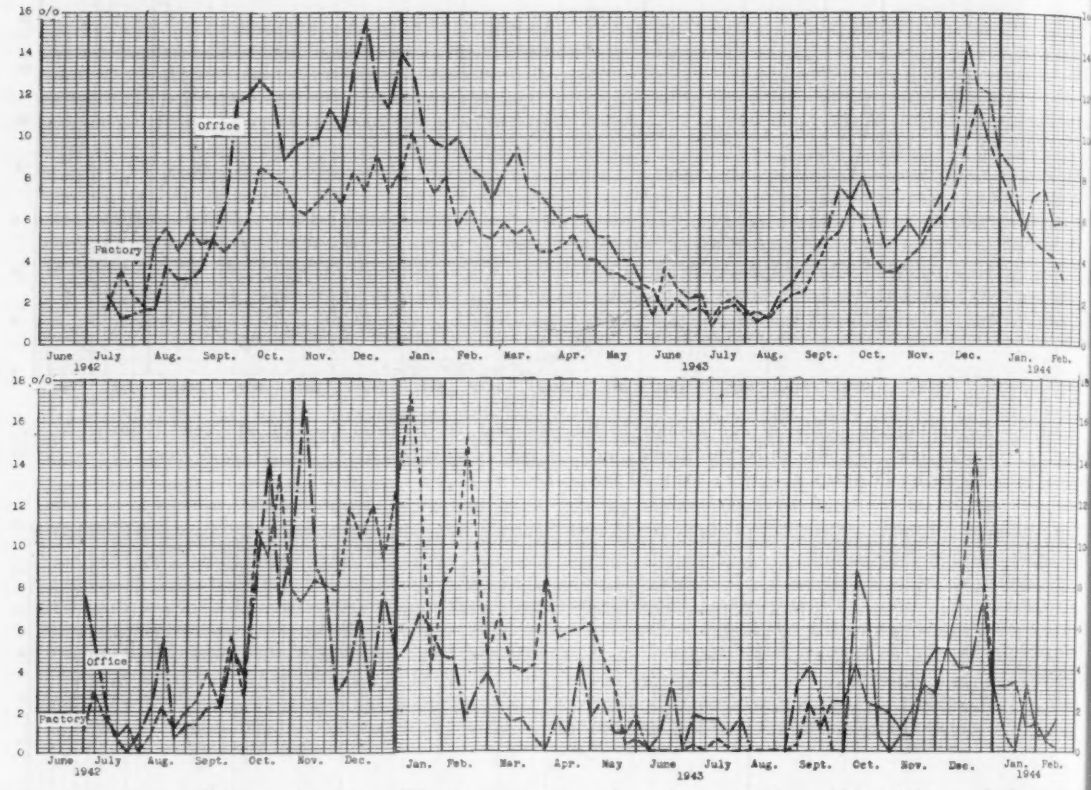

Chart 7.—Seasonal trend of colds: Weekly percentage of employees having colds in Johnson & Johnson all subsidiaries (upper half of chart) and in one subsidiary—Personal Products (lower half of chart).

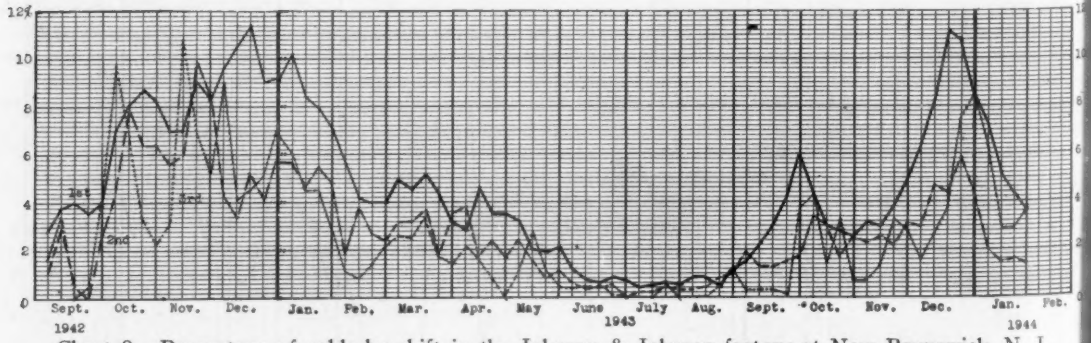

Chart 8.—Percentage of colds by shift in the Johnson & Johnson factory at New Brunswick, N. J.

Age.—The highest incidence of colds was found in the age group 20 to 29 years and the lowest in the age group above 50 years. However, the percentage of time-losing colds increases with age—17.2 per cent in the group who were under 20 years to 26.8 per cent in the group who were 50 years of age and over.

Sex.—There were more colds among women than among men. In New Jersey there were more colds among women throughout the year, as illustrated in the upper part of chart 6, while in Chicago women had more colds only in the winter months, although the total for the year was still higher for the women (lower part of chart 6).

Type of Work (office vs. factory).—There were consistently more colds among office employees than among factory employees (upper part of chart 7). In some of the smaller plants, where all employees were housed in the same building, the difference in the incidence of colds between the office and the factory employees was negligible (lower part of chart 7).

Shift.—There was little relationship between the shift and the incidence of colds, as illustrated by chart 8. There seems to be a slightly higher percentage of colds in the first shift.

Plants.—There was a difference in incidence of colds in different plants in the same city.

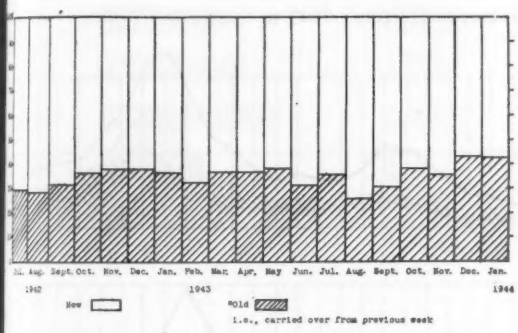

Chart 9.—Average weekly proportion of new colds and old colds in all plants. New colds are represented by white columns; old colds (i. e., carried over from the previous week), by cross-hatched columns.

Although this factor was not studied further, it indicates the influence of ventilation and heating on the problem. The plants were reasonably uniform in all other respects.

Ventilation.—Time-losing colds in air-conditioned places were below average except in the summer months. The shipping departments uniformly had a high general incidence of colds and a high incidence of time-losing colds. These departments usually are drafty. In each plant certain departments consistently had a high incidence of colds. Although these departments were not studied completely, most of them had some factor of ventilation that was not up to the average. I should point out that figures on ventilation might be misleading because of the in and out movements of the occupants from one type of atmosphere to another.

Duration of Colds.—The majority of colds lasted less than a week. Colds among men lasted longer. There was little difference between New Jersey and Chicago in the duration of colds.

Severity of Colds.—There was virtually no difference geographically in the percentage of

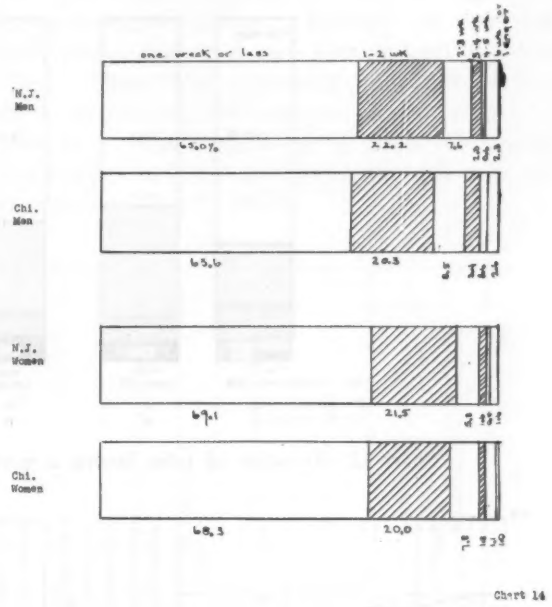

Chart 10.—Comparative length of colds in men and women (February 1943 to January 1944).

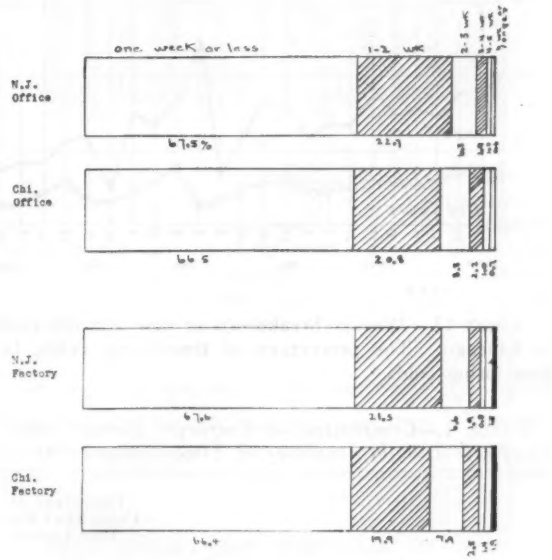

Chart 11.—Comparative length of colds in office and factory (February 1943 to January 1944).

employees having time-losing colds except in December 1943. However, the percentage of colds that were time losing was twice as great in New Jersey as in Chicago, as illustrated in

charts 13, 14 and 15. There were many more time-losing colds among women throughout the year (chart 16). Even though the percentage of employees with time-losing colds was a little smaller in the summer months, there was no definite seasonal pattern. On the other hand, temperature had a marked influence: There was marked in New Jersey than in Chicago (cha 17).

Stenographic and clerical workers were m prone to take time off for colds, as illustrat in table 1.

Posture had a marked influence on the sever of colds. The smallest percentage of time-losi

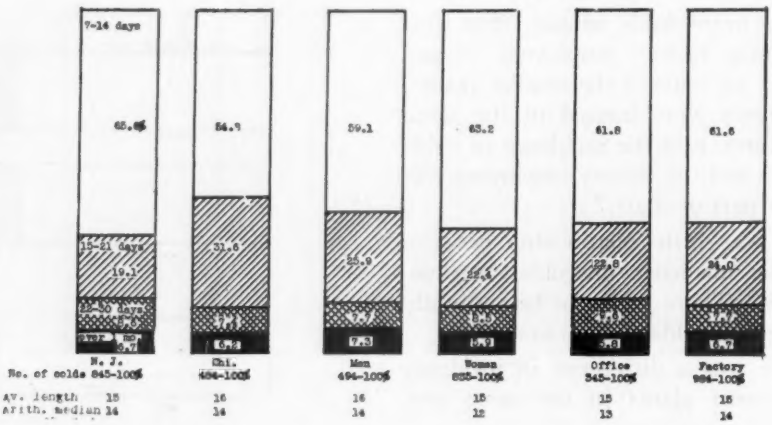

Chart 12.—Duration of colds lasting a week or longer (October 1942 to September 1943).

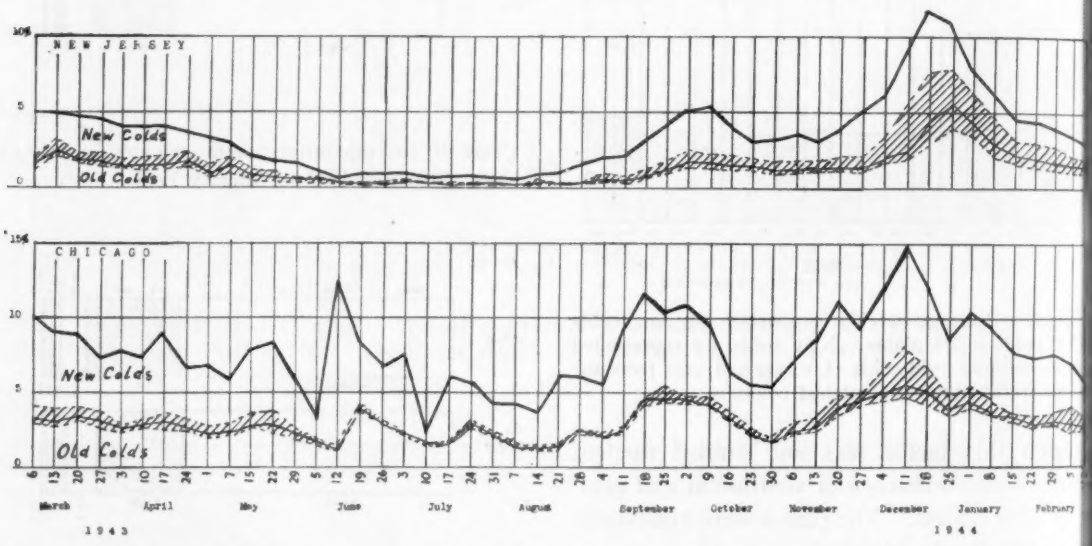

Chart 13.—Weekly breakdown of new and old colds showing the greater prevalence of both new and old co in Chicago. The percentage of time-losing colds, however, differed little. The cross-hatched zone repres time-losing colds.

TABLE 1.—*Comparison of Employee Groups with Respect to the Incidence of Time-Losing Colds*

	Percentage of Colds That Were Time Losing
Executives	19.5
Secretaries	23.9
Office machine employees	35.9
Other office employees	26.2
Factory machine employees	16.0
Other factory employees	16.8

TABLE 2.—*Comparison of Activity Group with Respect to Incidence of Colds*

	Percentage of All Colds	Percentage Colds Lasting Week or Mo
Employees who sit at their jobs	29.6	23.7
Employees who are up and down	31.2	35.8
Employees who stand	20.9	30.2
Employees who walk	18.3	10.3

a greater rise in time-losing colds with each severe drop in temperature, and this was more

colds was found among those who walk ab at their jobs, and the highest percentage am those who most of the time sit at their jobs (cluding the "up and down" group).

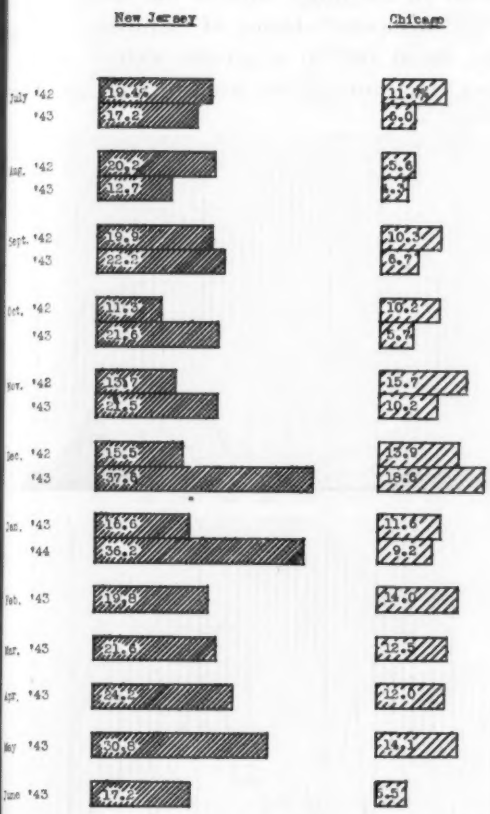

Chart 14.—Percentage of colds that were time-losing, months.

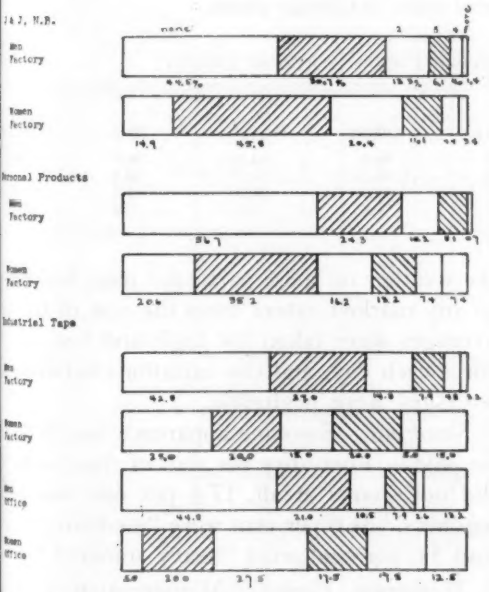

Chart 15.—Annual incidence of colds: Percentage of ons having a given number of colds among em- yees for whom a full year's record was available ruary 1943 to January 1944).

Time Lost.—There was only slight geographic difference in time lost—four and two-tenths days per thousand working days in New Jersey and three and one-tenth days per thousand working days in chicago (chart 19, part I). Absenteeism due to colds was twice as high in offices as in factories, six and nine-tenths days and three and two-tenths days, respectively. Sex differences are represented as follows: Women lost four and nine-tenths days and men two and seven-tenths days. There was surprising uniformity in the time lost among the various plants (chart 19, part II). Absenteeism due to colds throughout the study was less than 2 per cent with only one exception (March 1942).

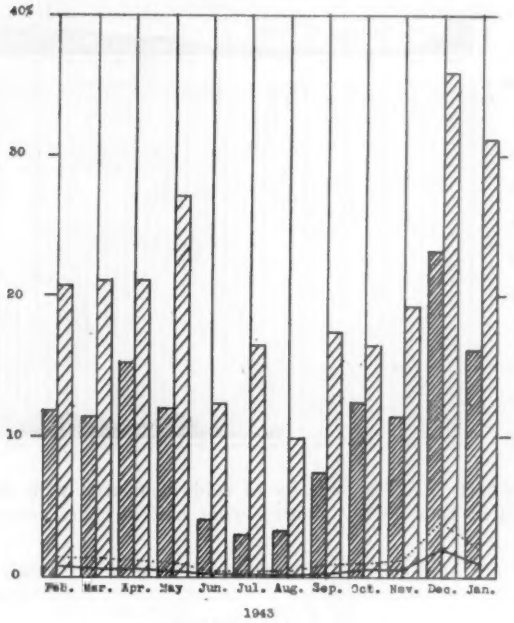

Chart 16.—Time-losing colds. The curves represent the percentage of women (– – –) and the percentage of men (——) having time-losing colds. The columns represent the percentage of women's colds that were time-losing (lightly cross-hatched) and the percentage of men's colds that were time-losing (heavily cross-hatched).

Recurrence of Colds.—Women were half again as susceptible to catching colds as men. Women had 1.6 colds per year, while men had 1.0 cold per year.

DATA FROM CASE HISTORIES OF ALL SEVERE COLDS

Locale of Colds.—It was found that the majority of colds lasting a week or longer started in the head and spread to the throat or the chest. The colds in Chicago were more severe in that they spread beyond the head region. Colds among office personnel were more severe than

those among the factory workers. There were more colds involving the chest among the men than among the women.

Day of Onset.—This became an important factor. In New Jersey during the winter months the largest number of colds started on Saturday, while during the rest of the year a slightly larger number started on Mondays. In Chicago, almost as many colds started on Mond as on all the other days of the week combin The "week-end" factor of Saturday and Mo day stood out to a greater extent among men than among the women. To see whet

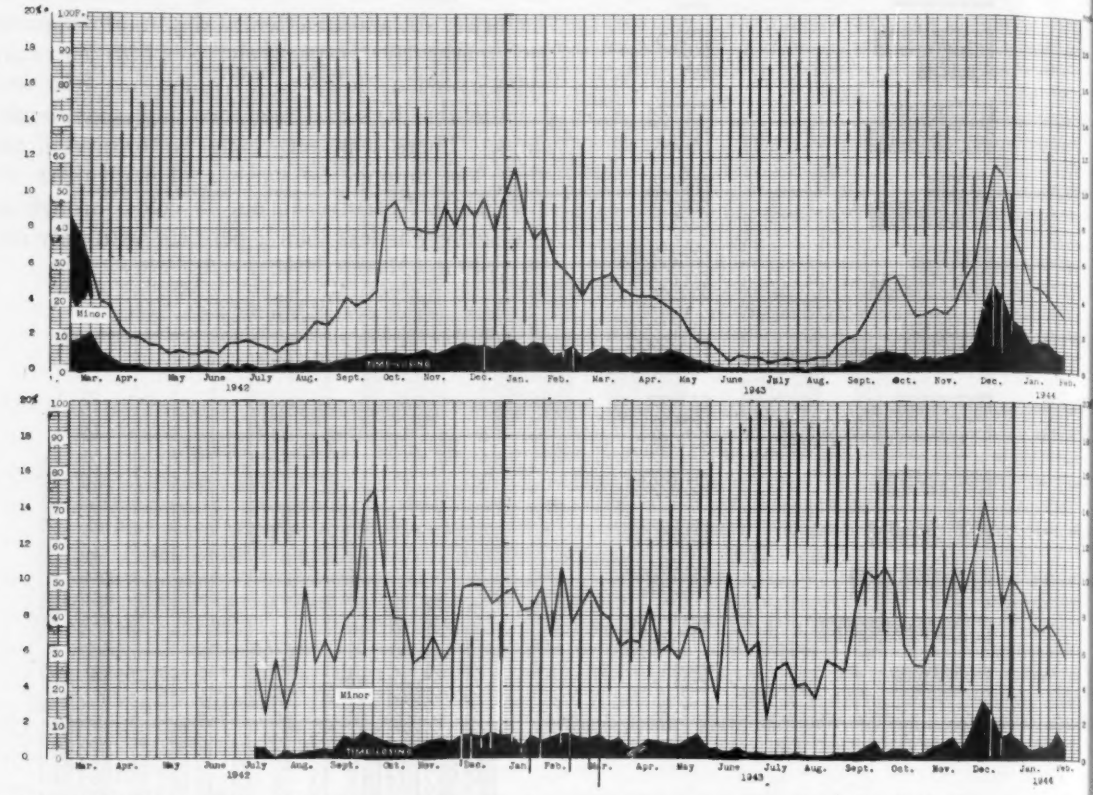
Minor
Time-Losing
Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb.
1942 1943 1944
Minor
Time-Losing
Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb.
1942 1943 1944

Chart 17.—The severity of colds compared with the range of temperature. Upper half of chart, percentage colds in New Jersey plants; lower half of chart, percentage of colds in Chicago plants.

TABLE 3.—*Percentage of Colds Involving Various Physical Locales*

Locale of Colds	Total of Plants	New Jersey	Chicago	Offices	Factories	Men	Women
Head	85.2	79.9	94.8	86.5	84.6	86.7	84.3
Throat	43.1	39.1	50.4	50.1	40.7	38.9	45.6
Chest	31.7	28.1	29.3	35.9	30.2	34.3	30.2
Back	1.2	1.7	0.2	0.6	1.4	0.2	1.8

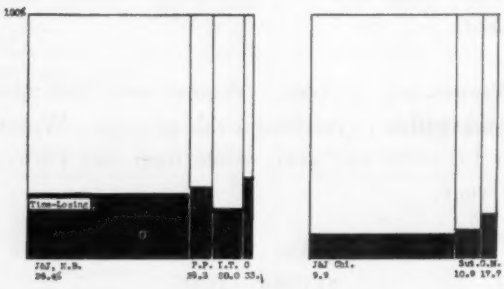

Chart 18.—Comparison of various plants with respect to percentage of colds that were time-losing (February 1943 to January 1944).

the weather on these particular days had differ to any marked extent from the rest of the we averages were taken for high and low temper tures each day, and the variations between th averages were negligible.

Smoking.—Smoking apparently had little ef on colds. Forty-five per cent of those with co did not smoke at all, 17.4 per cent were "li smokers," 31.6 per cent were "medium smoke and 5.6 per cent were "heavy smokers."

Menstrual Period.—Menstruation is an portant factor in the incidence of colds am women and may well be fully as important the increased severity of colds among th In the 723 cases recorded on chart 23 the p of incidence occurred on the first day of m

Chart 2
n 1 for

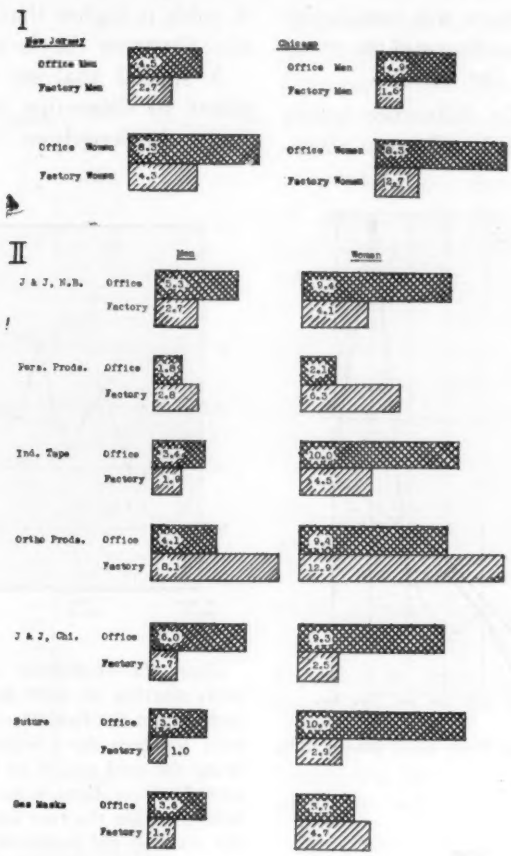

Chart 19.—Number of days lost through colds per thousand man-days worked (February 1943 to January 1944): *I*, by area and sex; *II*, by plant and sex.

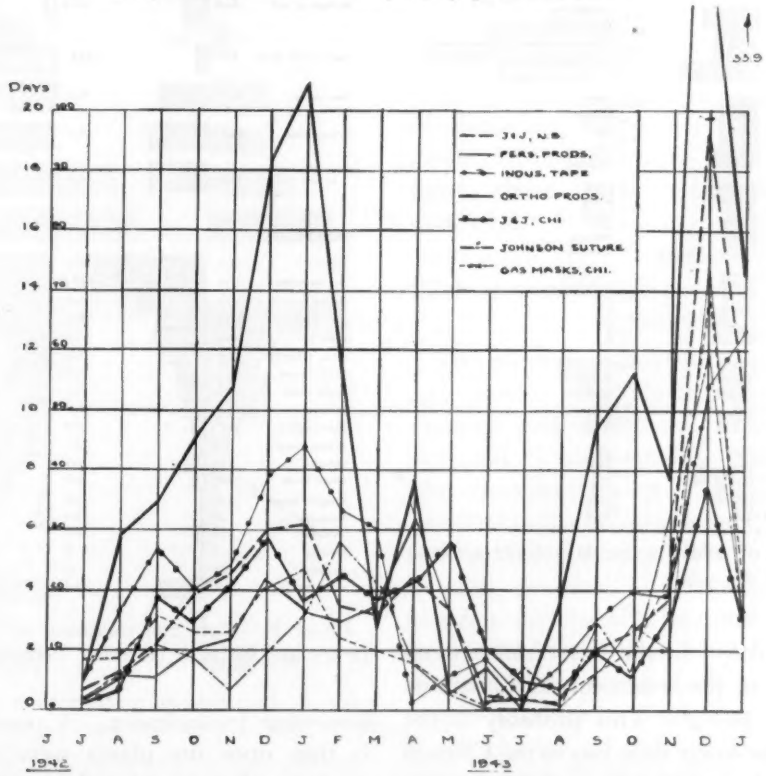

Chart 20.—Number of days lost through colds per thousand man-days worked in individual plants. See art I for explanation of the abbreviations in the key.

struation. Further, the incidence was practically identical in the three days preceding and the three days following the onset of the period.

Care of Colds.—A notable difference exists between the New Jersey and the Chicago plants in the care of colds. In the latter much more attention is paid to the treatment, as illustrated in charts 24, 25 and 26. This probably is the explanation for the lower time loss in the Chicago plants even though the incidence and the severity of colds is higher than in the East. The charts also illustrate the factors of medication.

A special analysis was made in five of the plants to determine whether staying home reduced the length of the cold. The figures are somewhat inconclusive. A possible explanation is that since the plants were engaged in war work, employees were reluctant to take time off

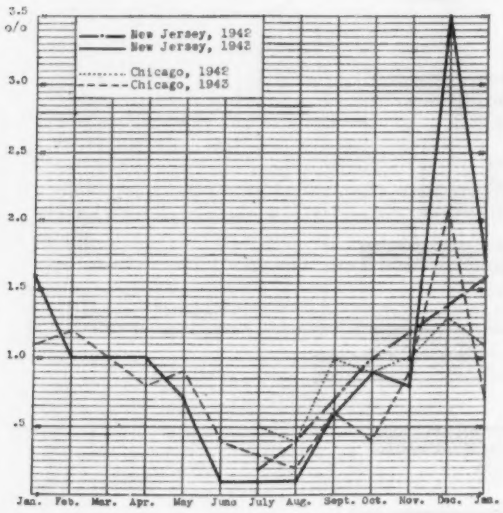

Chart 21.—Percentage of employees with time-losing colds.

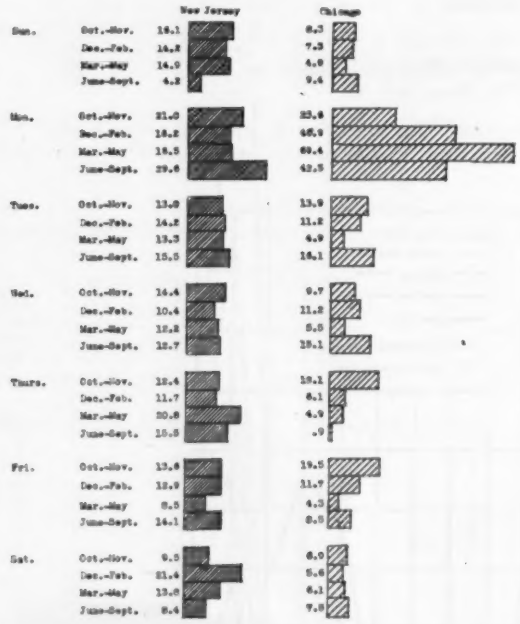

Chart 22.—Onset of colds by the day of the week at different periods of the year.

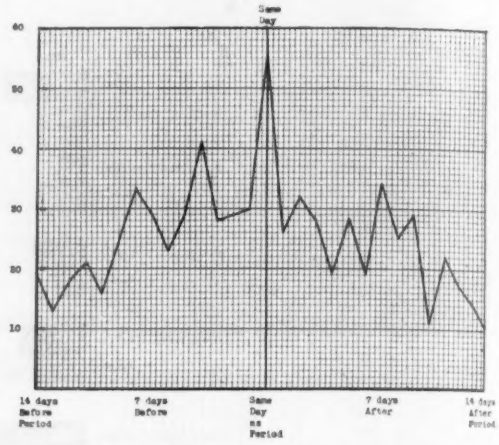

Chart 23.—Influence of menstruation: Number of colds starting on each day of a twenty-eight day period centered on the first day of menstruation. Because more than fourteen days before or fourteen days after may bring the cold nearer to a previous or a later menstrual period whose dates were unreported, only the 753 cases falling within the two weeks immediately before or after the start of the menstrual period were charted.

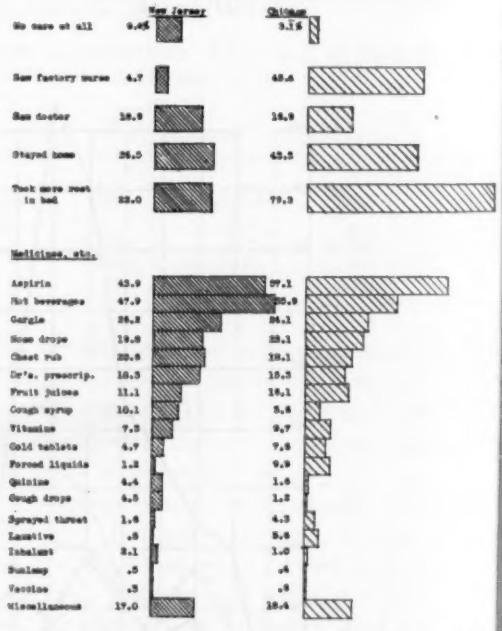

Chart 24.—Care and treatment of long colds in New Jersey and Chicago (October 1942 to September 1943)

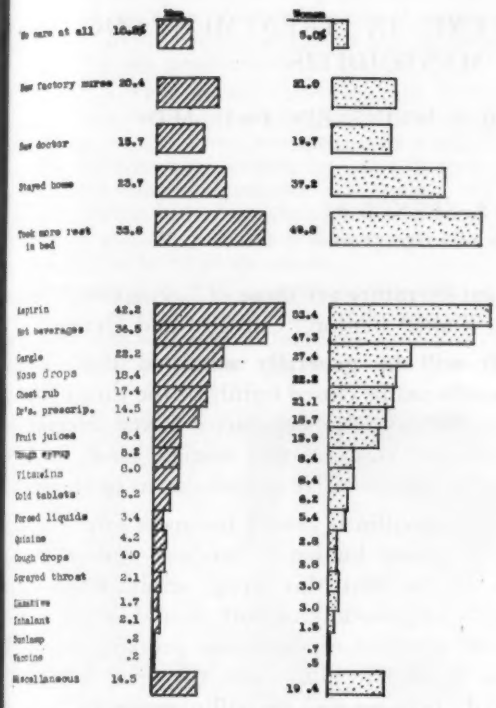

Chart 25.—Care and treatment of long colds in the two sexes (October 1942 to September 1943).

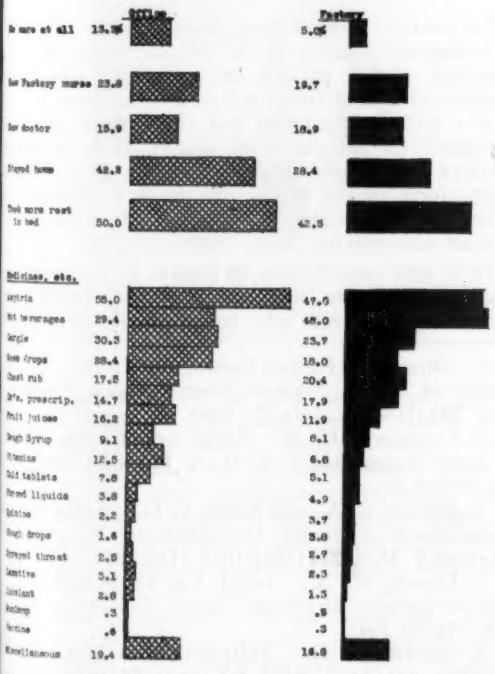

Chart 26.—Care and treatment of long colds in office and factory (October 1942 to September 1943).

In severe colds, staying home some time within the first three days was somewhat helpful in shortening the duration.

SUMMARY

1. There is a definite pattern to the incidence of colds, with the highest peak in December (or December-January) and a lesser peak in October.

2. July is uniformly the month of the lowest incidence of colds.

3. Sudden drops in temperature are followed by rises in the incidence and in the severity of colds.

3. The incidence and the severity of colds are much greater among office workers than among factory workers.

5. The incidence and the severity of colds are much greater among women than among men.

6. A majority of the colds in women were reported to have appeared at the time of the menstrual period.

7. There is decreasing incidence of colds with increasing age. However, the severity of colds increases with age.

8. There are fewer colds in air-conditioned plants. The incidence of colds is highest in drafty places.

9. More colds start on Monday than on any other day of the week. This is especially true of colds among men.

10. Posture is an important factor in the incidence and the severity of colds: The incidence and the severity of colds are lowest among those whose work necessitates walking about most of the time.

11. Early therapy seems to be of the greatest value at present.

COMMENT

The purpose of this study was to gather basic and detailed facts about the occurrence of the common cold in industry, to correlate the findings and to make analyses and interpretations. The incidence pattern of colds is most striking, while the influence of the fluctuation of temperature on the incidence and the severity of colds is most positive. The statistical relationship between physical and environmental factors and the incidence of colds has been established. Certain interesting aspects have been uncovered that require continued attention, such as the relation of the physiologic state of the individual to the time of onset of the cold.

151 Livingston Avenue.

PENICILLIN AND PRIMARY SUTURE IN TREATMENT OF ACUTE SURGICAL MASTOIDITIS

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The purpose of this report is to record our experience in treating 23 patients having acute surgical mastoiditis by means of primary closure of the mastoid wound and instillation of penicillin into the mastoid cavity.

The desirability of primary closure of mastoid wounds has been apparent to otologists for nearly half a century. Blake and Reik [1] in 1906 advocated use of primary suture with the blood clot method. Their contention was that blood serum in the mastoid cavity had sufficient bactericidal power to kill the offending organisms and that clotted blood had greater bactericidal power than circulating blood. While much interest in this work was displayed by otologists, and notwithstanding a modicum of success, the use of primary suture was discontinued, and the method has been in disuse for the last two or three decades.

With the advent of chemotherapy and its proved efficacy in treating infections, otologists again were quick to realize the possibilities of primary suture combined with the local or general use of sulfonamide drugs. Two of us have recorded our experience in the treatment of 44 patients at the Massachusetts Memorial Hospitals in employing sulfonamide compounds for whom primary suture of mastoid wounds was used. [2] Other articles on this subject in the recent literature are those of Livingston,[3] Tucker and Flake,[4] Fenton,[5] Currier [6] and Herzig.[7]

It will be generally admitted that if such wounds can be closed tightly at the time of operation, the risk of postoperative mixed infections, prolonged stay in the hospital and frequent painful postoperative dressings can be eliminated.

As penicillin is one of the most effective antibiotic agents known to medical science, it was felt by us that this drug administered either locally or generally or both should be the answer to the problem of successful primary suture. It was decided to administer the drug locally primarily because less penicillin would be required by this method than if the intramuscular route were employed.

SUBJECTS AND METHODS

The subjects treated were patients in the department of contagious diseases of the Massachusetts Memorial Hospitals. In 21 patients the mastoiditis was a complication of scarlet fever, and in 2 it followed measles. It is a well observed fact that any surgical procedure attempted on patients with scarlet fever is usually followed by delayed healing, and in some cases of severe form of the disease the healing process is an entity scarcely related to that occurring in patients without scarlet fever.

Their ages ranged from 20 months to 14 years. The patients had acute mastoiditis without complication except for 3 patients who had subperiosteal abscess.

This work was done under a grant from the Johnson Research Foundation, New Brunswick, N. J.

Read at the Forty-Ninth Annual Session of the American Academy of Ophthalmology and Otolaryngology, Oct. 12, 1944, Chicago.

From the Departments of Otolaryngology and Internal Medicine, Boston University School of Medicine, the Evans Memorial and the Haynes Memorial of the Massachusetts Memorial Hospitals.

The penicillin used in this study was provided by the Office of Scientific Research and Development from supplies assigned by the Committee on Medical Research for clinical investigations recommended by the Committee on Chemotherapeutics and Other Agents of the National Research Council.

1. Blake, C. J., and Reik, H. O.: Surgical Pathology and Treatment of Diseases of the Ear, New York, D. Appleton and Company, 1906, pp. 252-255.

2. Johnson, L. F., and Spence, P. S., Jr.: Primary Suture of Simple Mastoid Wounds, New England J. Med. **231**:116-118 (July 27) 1944.

3. Livingston, G. S.: Local Sulfonamide Therapy in Acute Mastoiditis, J. A. M. A. **117**:1081-1085 (Sept. 27) 1941.

4. Tucker, C. A., and Flake, C. G.: Sulfadiazine in Management of Simple Mastoidectomy Wounds, New England J. Med. **227**:1021-1024 (Dec. 31) 1942.

5. Fenton, R. A.: Local Use of Sulfathiazole in Otolaryngologic Practices, Arch. Otolaryng. **37**:494-495 (April) 1943.

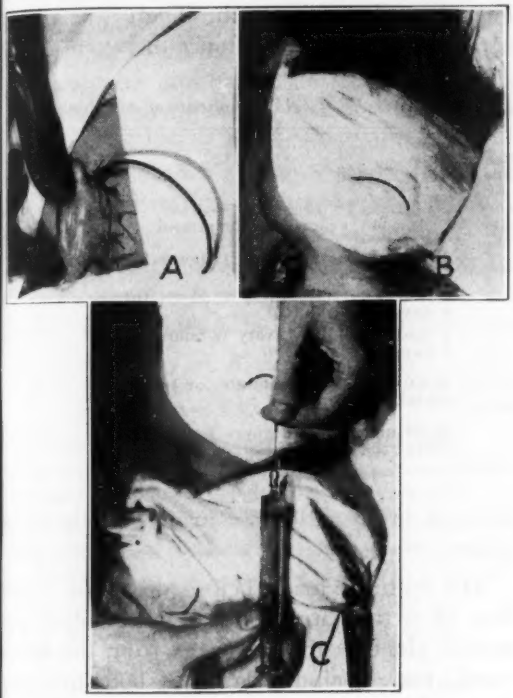
6. Currier, W. D.: Sulfathiazole in Mastoidectomy Wounds, Ann. Otol., Rhin. & Laryng. **51**:955-960 (Dec.) 1942.

7. Herzig, A. J.: Use of Sulfa Drugs in Mastoidectomy Wound Where Complete Enclosure Is Employed, Laryngoscope **54**:199-208 (May) 1944.

and 1 who had phlebitis of the lateral sinus. Suppurative otitis media developed in from one to twenty-eight days after the patients' admission to the hospital for scarlet fever or for measles, and mastoidectomy was carried out in eleven to forty-four days after the beginning of the aural discharge, except that 1 patient who had a large subperiosteal abscess was operated on five days after his admission to the hospital.

All patients were studied bacteriologically preoperatively, at the time of operation and on several occasions postoperatively. At least three preoperative and postoperative cultures were secured for every patient; for some patients many more cultures were studied. At the time of operation both the external auditory canal and the purulent exudate in the mastoid bone were examined by all available bacteriologic means.

At operation a careful complete exenteration of all cells in the mastoid process was performed and the perilabyrinthine cells removed until the horizontal canal was sharply defined. The zygomatic cells were thoroughly exenterated, and in most cases a part of the sinus was exposed. The plate over the lateral sinus was removed in those cases in which this procedure was considered expedient. Special attention was given to hemostasis, and when necessary epinephrine hydrochloride packs were applied to produce a dry cavity.



A, the primary closure, with catheter in place; *B*, the bandaged wound, with catheter easily accessible; *C*, the method of administering penicillin.

The wound was closed in two layers, surgical gut being employed subcutaneously and a Poole stitch with silk for the skin. A small, no. 4 or no. 5 ureteral catheter was inserted through the suture line to the mastoid antrum and held securely in place by a stitch. If the mastoid cavity was unusually large, a second ureteral catheter was inserted to the mastoid tip. Every effort was made to produce a wound which would be water-tight, in order to prevent the escape of penicillin. A sterile steel phonograph needle was used to plug the distal end of the catheter. Immediately on completion of the operation penicillin was injected into the cavity by way of the catheter and repeated injections made as described in the following section.

PROCEDURE AND RESULTS

The dosage of sodium penicillin necessary to produce complete healing of the postaural wound and a dry external canal was determined by trial and error. The first 3 patients treated were given 4,000 units (in a volume of 2 cc.) by way of the ureteral catheter every twelve hours for three days, until a total of 24,000 units had been administered. All of the patients showed complete healing of the postaural wounds and dry external canals at the end of this time and remained well for the next week or ten days, the time during which they were under observation.

The next 4 patients who were subjected to mastoidectomy and given the same quantity of penicillin all had recurrences of the aural discharge in from one to four days after cessation of the treatment and had to be retreated. Two of these patients were given 4,000 units of penicillin by way of the catheter every twelve hours for six and one-half days (a total of 52,000 units) and at the end of this time showed complete healing of the operative wounds and absence of discharge from the external canals; the third patient was given the same dose of the antibiotic agent for eight days and remained well after this second course of treatment; retreatment of the fourth patient by administration of 10,000 units of penicillin every twelve hours for five days (a total of 100,000 units) produced a complete cure.

Since the smaller dose of penicillin (4,000 units every twelve hours for three days) was obviously insufficient to produce cure in one course of treatment, the next patient with acute suppurative mastoiditis following scarlet fever for whom operation was required was given 10,000 units of penicillin (in a volume of 2 cc.) by way of the ureteral catheter inserted into the mastoid cavity every twelve hours for three days, a total of 60,000 units being used. On the fourth postoperative day the sutures and the catheter were removed; the postaural wound was found to be healed, and the external canal was dry. Five days later, however, purulent discharge from the ear recurred. The catheter was reinserted into the mastoid cavity through a small incision in the skin and 15,000 units of penicillin injected every twelve hours for four days (a total of 120,000 units). After this course of therapy the wound remained well healed and the external canal dry for the rest of the patient's stay in the hospital

Since, except with the first 3 patients, failure to produce complete cure of the mastoiditis in one course of treatment appeared to be due to use of insufficient quantities of penicillin, the next 15 patients with acute suppurative mastoiditis who were operated on were treated in the following manner: Immediately after the ureteral catheter had been inserted into the mastoid cavity and the postaural wound tightly closed, 10,000 units of penicillin in a volume of 2 cc. was instilled and the same dose injected every eight hours for four days, until a total of 120,000 units had been administered. The skin sutures and the ureteral catheter were removed in an aseptic manner on the fourth postoperative day, the wound cleansed gently with a sponge soaked in alcohol and a dry sterile dressing applied. The dressing was removed once daily to note the state of the wound. All patients were observed for a minimum of seven days after cessation of penicillin treatment, and some were kept for two weeks or longer. In 1 of these, a young boy in whom otitis media and mastoiditis had developed as complications of measles, discharge from the ear which had been operated on recurred fifteen days after cessation of the first course of treatment. He was retreated by insertion of a ureteral catheter into the mastoid antrum through a small incision in the postaural skin and given 10,000 units of penicillin every eight hours for five days, a total of 150,000 units. After this second course of treatment he remained well.

Summary of Clinical Results of Treatment of Surgical Mastoiditis by Local Application of Penicillin

Dose of Penicillin	No. of Patients Recovering After One Course of Treatment	No. of Patients Requiring Second Course of Treatment to Effect Cure	Dose of Penicillin Used in Second Course of Treatment	No. of Patients Completely Recovered After One or Two Courses of Treatment
4,000 units every 12 hours for 3 days (total, 24,000 units)	3	4	2 cases: 4,000 units every 12 hours for 6 days (total, 52,000) 1 case: 4,000 units every 12 hours for 8 days (total, 64,000) 1 case: 10,000 units every 12 hours for 5 days (total, 100,000)	7
10,000 units every 12 hours for 3 days (total, 60,000 units)	0	1	15,000 units every 12 hours for 4 days (total, 120,000)	1
10,000 units every 8 hours for 4 days (total, 120,000 units)	14	1	10,000 units every 8 hours for 5 days (total, 150,000)	15

BACTERIOLOGIC OBSERVATIONS

Bacteriologic studies of the exudates present in the external canal and in the mastoid cavity were made before and after operation and at the time of operation. Each of the patients, with the exception of the 2 who had measles, had been found to be harboring beta hemolytic streptococci in the pharynx at the time of admission to the hospital. Cultures of the exudate in the external canal were made a minimum of three times before operation; single specimens of the pus of the mastoid were taken for culture at the time of operation and daily bacteriologic examinations of the external canal and the postaural wound were carried out from the time when the catheter and the sutures were removed until the patient left the hospital. Specimens for bacteriologic examination were obtained by means of sterile cotton swabs and were streaked on heart infusion agar containing horse blood and inoculated into horse–blood–heart infusion broth within a short time after they were taken. The cultures were examined after twenty-four and forty-eight hours' incubation at 37 C. and the predominating organisms determined; the broth cultures were streaked out on blood–heart infusion agar when they showed good growth. There was complete agreement in every instance between the cultures in broth and those made directly on agar plates.

The cultures made before operation revealed that 18 of the patients had beta hemolytic streptococci alone in the discharge from the external canal; the remainder harbored both this organism and hemolytic, coagulase-positive Staphylococcus aureus. The 2 patients with otitis media complicating measles harbored both organisms.

Cultures taken from the exudate in the mastoid cavity at operation revealed no growth in 3 patients; all of these had had pure cultures of beta hemolytic streptococci in the external canal preoperatively. It is interesting that 2 of these patients had received sulfamerazine orally when otitis media developed. No other patients reported on in this study had received any treatment until penicillin was given postoperatively. Sixteen of the cultures of material from the mastoid cavity at the time of operation showed pure growths of beta hemolytic streptococci. Four revealed hemolytic, coagulase-positive Staph. aureus; 3 of the patients who provided

he material for the cultures had had both the streptococcus and the staphylococcus in the exudate in the external canal prior to operation, while the fourth had shown a pure culture of beta hemolytic streptococci.

Postoperative bacteriologic studies of the external auditory canal and the postaural wound revealed the type of bacterial flora which might be expected to be present normally on skin; thus, nonhemolytic or slightly hemolytic strains of Staph. aureus, Staphylococcus albus, diphtheroids and alpha streptococci were recovered from almost every patient. In a number of instances cultures from the external canal made shortly after cessation of the treatment with penicillin were sterile. Beta hemolytic streptococci were present in the external auditory canal of 5 patients after therapy with penicillin; 3 of these patients had recurrences of the discharge from the affected ear and had to be retreated. Of the patients requiring second courses of treatment with penicillin before favorable results were obtained, 4 harbored a combination of hemolytic, coagulase-positive Staph. aureus and beta hemolytic streptococci in the discharge from the external ear prior to operation; the mastoid cavities of 3 of the 6 patients were sterile, while those of the other 3 contained beta hemolytic streptococci.

Summary of Bacteriologic Data

Organisms Found	No. of Patients
Beta hemolytic streptococci in external canal preoperatively	18
Beta hemolytic streptococci and Staph. aureus in external canal preoperatively	5
Beta hemolytic streptococci in mastoid cavity at operation	16
Staph. aureus in mastoid cavity at operation	4
Sterile cultures from mastoid cavity at operation	3
Staphylococcus and Streptococcus in external canal preoperatively and Staph. aureus alone in mastoid cavity at operation	3
Streptococcus in external canal preoperatively and Staphylococcus alone in mastoid cavity at operation	1
Streptococcus in external canal postoperatively (3 of these patients had recurrent aural discharge)	5
Staphylococcus and Streptococcus preoperatively in external ear; retreatment required.	4
Only Streptococcus in external canal preoperatively; retreatment required	2
No growth in mastoid cultures from patients requiring retreatment	3
Beta hemolytic Streptococcus in mastoid cultures from patients requiring retreatment	3

COMMENT

The advantage of primary closure of mastoid wounds is obvious, and the use of this procedure has been made feasible by the availability of chemotherapeutic agents sufficiently potent to inhibit and eventually to aid in the killing of bacteria that remain in the mastoid cavity after careful surgical procedure. While sulfonamide compounds have contributed much to making primary suture in mastoidectomy a rational procedure, their use is not without danger, since any of the toxic or sensitizing effects of these drugs may be manifested when they are used to fill the mastoid cavity. Only recently a case has been seen in which severe hemolytic anemia developed after a mastoidectomy in which primary closure and packing of the wound with sulfadiazine were employed. Penicillin has many advantages over the sulfonamide drugs, not the least of which is that, to all intents and purposes, it is without dangerous side effects.

The time interval between operation and complete healing with discharge from otologic care is appreciably less with penicillin treatment than has been reported when primary suture of the mastoid wound and packing with one of the sulfonamide drugs is used.[2] Since penicillin locally applied appears capable of producing rapid and good healing of postaural wounds and dry external canals after use of relatively small amounts (120,000 units), it would seem the ideal agent to use in the treatment of infections of the mastoid bone due to the gram-positive cocci. The local method of application seems preferable to the parenteral route for several reasons: First, the agent is applied directly to the site where the bacteria are present and reaches this site in its highest concentration; second, the number of manipulations required in the total treatment is reduced to a minimum, and the patients are spared much disturbance and discomfort. (Slight, momentary discomfort is complained of by some patients when the penicillin is injected into the catheter.)

The following method is proposed for the treatment of suppurative mastoiditis complicating suppurative otitis media which occurs in the course of scarlet fever or measles: A careful, complete exenteration of the mastoid process is carried out. The wound is closed in two layers in such a manner that a completely water-tight wound is produced. Before the closure is made, a no. 4 or no. 5 ureteral catheter is inserted into the mastoid antrum and anchored to the skin with a single silk suture. As soon as the operation is completed, 10,000 units of penicillin (the sodium salt) in a volume of 2 cc. is injected slowly into the catheter and the distal end plugged with a sterile phonograph needle. Every eight hours thereafter the needle is removed with sterile

forceps, 10,000 units of penicillin injected into the catheter by means of a no. 22 needle attached to a syringe and the phonograph needle reinserted. All manipulations are carried out with completely asceptic technic. After four days of treatment, during which 120,000 units of penicillin has been administered, the skin sutures and the catheter are removed, the wound cleansed with alcohol and a dry sterile dressing applied. The dressing is removed and the wound and the external canal examined daily. Any patient who has a recurrence of the aural discharge is retreated by insertion of a ureteral catheter into the mastoid antrum through a small incision in the postaural skin and a four day course of penicillin therapy (120,000 units) given again.

A large number of the patients who have been treated by local application of penicillin after operation for acute mastoiditis were seen several months after leaving the hospital, and none of them has had any recurrence of discharge from the ear or any symptoms which would point to residual disease on the affected side.

SUMMARY

Twenty-three patients with suppurative mastoiditis following scarlet fever and measles were treated by simple mastoidectomy and local application of penicillin in the mastoid cavity. Of these, 17 showed complete cure after one course of treatment, while 6 remained well after a second course of penicillin. The recommended dose of the drug is 10,000 units every eight hours for four days (a total of 120,000 units).

Local application of penicillin in the mastoid cavity through a ureteral catheter after mastoidectomy appears to be a feasible and practical pr cedure. When this drug is given in proper dosa healing of the postaural wound and a dry exter auditory canal usually are present on the fi postoperative day. In cases in which aural d charge recurs, reinsertion of the catheter a reinjection of penicillin for an appropriate per of time produce complete clearing of the d charge. Local treatment with penicillin see preferable to use of sulfonamide compounds infections with Staph. aureus, hemolytic str tococci and other organisms susceptible to antibiotic agent because of the absence of a harmful toxic effects, the slight risk of sensiti tion and the increased speed of healing.

NOTE.—Reference to the work of Florey and Fl was inadvertently omitted from the body of our pa These investigators were the first to treat mastoiditi operation and local instillation of penicillin. T treated 16 patients with acute and 6 patients with chr mastoiditis due to hemolytic Streptococcus, Pneumo cus or Staphylococcus aureus by mastoidectomy follo by insertion of a small rubber tube into the mas cavity and periodic instillation of penicillin in vary doses. The ears of 19 patients so treated were dr five days or within ten days of operation. Primary h ing of the wound occurred in 14 of the patients with a and 5 of the patients with chronic mastoiditis. The of penicillin used during the entire course of treatm of a patient varied from 5,000 to 35,000 units, with average of 17,300 units.[8]

29 Bay State Road.
65 East Newton Street.
29 Bay State Road.

8. Florey, M. E., and Florey, H. W.: General Local Administration of Penicillin, Lancet **1**:387 (March 27) 1943.

THE PRACTICE OF OTORHINOLARYNGOLOGY IN AN ARMY GENERAL HOSPITAL

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INTRODUCTION

An Army general hospital is but one of the ny units of the Medical Department of the my. As such it plays its specialized part in rrying out the purpose of the Medical Depart- nt, viz., the affording of better facilities than n be provided in station hospitals for the care d disposition of those patients requiring pro- ged, special and definitive treatment. General spitals are of two types, numbered and named. e numbered general hospitals function in the ater of operations, while the named general spitals are located in the zone of the interior. tients admitted to the latter fall into three oups: first, military personnel attached to the titution itself, in all, a small fraction of the al number admitted; second, patients trans- rred from station hospitals in the adjacent area, l third, oversea evacuees. Because general spitals are designated for the care of military rsonnel requiring prolonged and definitive atment, often of a highly specialized nature, t most modern and advanced facilities are pro- ded in these institutions. Certain named gen- l hospitals have been further designated as cial centers for the handling of the blind, deaf, those requiring surgical operation on eye, those requiring amputations, persons th tuberculosis, neurosurgical patients and se requiring plastic procedures.

It is my purpose to present in the following ges a lucid picture of the otorhinolaryngologic tion of the O'Reilly General Hospital at ringfield, Mo. This Army hospital, initially 1,000 bed institution, was opened and dedi- ed on Nov. 8, 1941, just one month before treacherous Japanese attack at Pearl Harbor. iginally intended for the care of sick and in- ed soldiers in the Seventh Service Command, th the outbreak of war its horizon extended to lude every section of the globe. Early in 42 oversea casualties began to be evacuated the hospital in ever increasing numbers. With the growing demand for its facilities, the hospital has rapidly expanded to its present capacity of 2,351 beds. Its census grew from 1 patient on Nov. 8, 1941 to near capacity on Sept. 1, 1943. On the latter date 550 soldier-patients were admitted to the hospital, comparatively smoothly and with no appreciable disruption of the hospital routine.

The otorhinolaryngologic section, usually designated as the EENT (eye, ear, nose and throat) section, is one subdivision of the surgical service. Except for administrative purposes, however, ophthalmology has been separated completely from otolaryngology. This department has expanded continually with the growth of the entire hospital. The first patient was admitted to this section on Dec. 1, 1941, with acute otitis media. Whereas during the entire month of December 1941 only 21 patients were hospitalized in this section, on a single day, September 1, in 1943, 27 such patients were admitted. Up to Sept 1, 1943 a total of 1,182 patients had been hospitalized in the section. These figures, however, represent only a fraction of the work done by the department. They refer only to those persons admitted as bed patients in the hospital. As in any large civilian teaching institution or hospital center, consultations, examinations and treatments in the clinic comprise a large part of the work. From the opening of the hospital until Sept. 1, 1943, 27,322 patients were examined and treated in the clinic. During this same period 7,076 requests for consultation were answered. The professional staff has increased from two men, one otolaryngologist and one ophthalmologist, to six men—three of whom are certified by the American Board of Otolaryngology, and three by the American Board of Ophthalmology.

In describing any medical practice in an Army hospital, certain Army considerations that govern the medical decisions must be clearly understood. These are influenced largely by the interpretation of Army Regulations on physical standards for military service as they apply to each type of disability. For example, in an enlisted man a

Presented as a candidate's thesis to the American yngological, Rhinological and Otological Society, , in 1944.

chronic perforation of the tympanic membrane is disqualifying for any type of military service. If the perforation is not likely to close and the ear is in a relatively quiescent stage, the soldier will be returned to civilian status. This does not necessarily indicate that the Army otologist is blind to the fact that certain therapeutic measures might improve the condition of the ear. It indicates rather the realization that no reasonable amount of medical care is likely to improve the ear to the point where the soldier would meet even the minimal standards for military service. His prompt separation from the Army is therefore desirable and even imperative in order to avoid dissipation of precious medical manpower and facilities with no visible benefit to the armed forces. Instances of this sort could be multiplied in connection with such conditions as sinusitis, severe allergy, defective hearing and innumerable other variants of disabilities commonly encountered in civilian life, where the decisions as to indications for treatment and type of treatment to be employed might be entirely different because of the absence of military considerations. However, the example cited will suffice for purposes of illustration. Another important factor in determining whether any extensive treatment should be carried out in a particular instance is the "line of duty" status of the disability, that is, by whether the sickness or the injury is related to the soldier's military service. When the soldier's sickness or injury is incident to his military service, no effort is spared to obtain the maximum ultimate rehabilitation, even though the most optimistic prognosis would not anticipate his return to military duty. In contrast, when a disability exists which is not in line of duty, that is, one which existed prior to the soldier's entrance into military service, treatment is carried out only if it is reasonably certain that the soldier will be acceptable for military service without an uneconomic expenditure of time and effort. It is further assumed that no form of treatment will be carried out which in itself might become the basis of a claim against the government. In order to complete the picture of Army medical practices, it should be clearly understood that common sense and humanitarian considerations are not outlawed by Army Regulations: All emergency conditions as well as such catastrophes as tumor of the brain and cancer elsewhere in the body are afforded the utmost in medical care without any thought as to future military usefulness.

Before I proceed to a description of the actual practice of otolaryngology at O'Reilly General Hospital, it is necessary to digress briefly to discuss a necessity which is not readily apparent to the civilian practitioner. The Army has acquired a large number of persons who are maladjusted and who manifest their maladjustment after entrance into the armed forces. The neurasthenic patient who in civilian life frequents the doctor's office with exaggerated symptoms based on minor organic disturbances quickly becomes an Army casualty. Such persons along with others whose personalities are inadequate are classed as showing manifestations of psychoneurosis. When such a soldier-patient is referred to the medical officer in a general hospital and the record of his maladjustment to Army life is clearly apparent from previous significant incidents, considerations obtain that preclude treatment of the presenting complaint even when the complaint is on a clearly organic basis and readily amenable to therapeutic measures. These considerations are that the complete eradication of his organic disease would still leave him unfit for military service by reason of his psychoneurosis. Unless the disability is service incurred and in itself the basis of a claim against the government, he would, in all likelihood, be discharged from the Army, without adding any further burdens on the Army medical facilities. When the disability is in line of duty, every effort is made to correct it, provided it can be done in a reasonable period, even though his eventual discharge is mandatory because of his psychoneurosis. But if the treatment is likely to require much time, rather than have a general hospital bed occupied by a noneffective, the soldier is transferred to a veteran's hospital for necessary care. Every discharged soldier, regardless of his length of service or the status of his disability with respect to line of duty, is eligible for care in a veteran's hospital. When the aforementioned facts are understood clearly by the civilian physician, he will be more tolerant of the apparent contradictions between Army and civilian medical practice, knowing the compelling reasons for Army medical procedure.

SCOPE OF OTORHINOLARYNGOLOGIC OBSERVATION AT O'REILLY GENERAL HOSPITAL

From the opening of the hospital up to the time of writing my colleagues and I have had under our observation as in a panorama the entire field of otorhinolaryngology. It comprises not only diseases commonly seen in civilian life but numerous conditions peculiar to war. Limitations of space make it necessary to group the cases for general discussion, selecting those of special interest or significance for the more detailed analyses.

DISEASES OF THE EAR

Acute Otitis Media and Mastoiditis.—There ve been 52 hospital admissions based on a imary diagnosis of acute otitis media or acute itis media and mastoiditis. In 8 soldiers com- ete mastoidectomy was done; the other 44 came well without surgical exenteration of the astoid portion of the temporal bone. Most of ose with acute infections of the ear were treated ith one of the sulfonamide drugs. In a few cases, ecause of the appearance of the tympanic mem- ane, immediate paracentesis was performed. all instances in which the response to the rticular sulfonamide compound was not rapid, racentesis was done within twenty-four hours ter starting the chemotherapy, and there never as hesitation in repeating myringotomy as long there appeared to be any pus under pressure the middle ear. Cultures of material from e ears were made routinely, and blood counts ere made and blood levels of the sulfonamide ug were determined as long as there was any idence of infection. Roentgen studies of the astoid bones were made whenever indicated. o attempt is being made to estimate the rela- e values of the various laboratory procedures. is merely stated that in our opinion careful amination of the ear and evaluation of the inical findings furnish the most reliable infor- ation for the management of acute otitis media d mastoiditis.

It should be kept in mind that the group just entioned includes only those patients who en- ed the hospital with an admission diagnosis acute otitis media or acute otitis media and stoiditis. In many of them the infection of e ear was already several weeks old, and not ommonly it was the opinion of the medical ficer transferring the patient that operation was eady indicated. For example, on one occasion elegram was received stating that 5 "surgical stoids" were arriving by plane. All 5 patients d acute otitis media and mastoiditis, and all peared sick. In 1 the infection was two weeks d; in all the others it was from four to six eks old. We opened the ear in each case, stituted treatment with a sulfonamide com- nd and administered local treatment to the e and sinuses. In 1 case, twenty-four hours er admission, complete mastoidectomy was formed and a large persinuous abscess un- ered. In the other 4 cases no surgical inter- tion apart from myringotomy was required. 5 patients made complete recoveries and were rned to full military duty.

In addition to the soldier-patients sent to Reilly General Hospital with a transfer diagnosis of acute otitis media or acute otitis media and mastoiditis, there was a large group in which the acute otitis media was seen in consultation in other services in the hospital. All of these patients, treated with sulfonamide compounds and by myringotomy when that was indicated, made uneventful recoveries.

A rather unusual type of mastoiditis, not included in the foregoing list, is one which developed as a direct extension of osteomyelitis of the mandible. This occurred in a soldier who three months prior to his admission to O'Reilly General Hospital had a tooth extracted, with osteomyelitis of the mandible following the extraction. When he was first seen by us the entire external surface of the horizontal portion of each ramus of the mandible was exposed, as was a part of the ascending portion of the ramus on the left side. The temporomandibular joint was also involved. The soldier was treated by further incision and drainage, by chemotherapy, by administration of staphylococcus antitoxin, by various types of irrigations and by blood transfusions and other supportive measures. From the temporomandibular joint the infection extended into the left external auditory canal and gradually involved the entire left mastoid process. After a period of observation, signs of meningeal irritation developed and mastoidectomy was performed on the left side. Though the mastoid antrum was filled with creamy pus, there was no evidence of bone destruction. The sigmoid sinus, uncovered throughout its entire course, was thrombosed. Because the blood cultures had been consistently negative and because the condition of the patient was precarious we felt that while ablation of the sinus and ligation of the internal jugular vein were probably indicated, surgical judgment dictated that no further surgical work should be done at that time. He died eighteen hours after operation. The autopsy revealed not only septic thrombosis of the lateral sinus and early purulent meningitis but also osteomyelitis of the entire left side of the base of the skull.

Chronic Otitis Media and Mastoiditis.—There were 82 admissions on the basis of a primary diagnosis of chronic otitis media or chronic otitis media and mastoiditis. In addition, a number of patients with this diagnosis were seen in the other services in consultation, in whose cases the disease of the ear was not the principal reason for hospitalization. Generally, the chronic otitis media was the result of an old infection. Not uncommonly, the soldier was aware of a perforation of his ear drum, quite

often with an associated aural discharge, at the time of his induction examination.

We have been seeing with increasing frequency chronic perforation of the tympanic membrane due to concussion, resulting for the most part from detonation of high explosive shells and bombs. Hitherto the possibility of traumatic rupture of the tympanic membrane by external violence has been viewed with considerable skepticism. More and more soldiers, however, are returning from battle areas with a history of bloody discharge from one or both ears directly after the explosion of bombs or high explosive shells in their immediate neighborhood. Tinnitus invariably resulted, and not uncommonly a chronic aural discharge as well. All of them complained of deafness immediately following the explosion, but in the majority of instances the hearing improved rapidly within a few days. Ordinarily the ear became dry in a relatively short time; in those instances in which the discharge was still present when the soldier reached this hospital, often a month or more after the injury, it was mucoid or mucopurulent and responded readily to local therapy. The perforation varied from a small central one to practically complete destruction of the tympanic membrane. Roentgen films of the mastoid portions of the temporal bones were almost uniformly normal. In those instances in which a roentgenogram showed sclerosis of the mastoid portion we assumed that the soldier had had unrecognized chronic otitis media, possibly quiescent at the time of the explosion. Hearing tests usually showed only an early conductive deafness. In a few isolated cases there was severe or total deafness due, we believed, to pathologic changes other than the traumatic perforation of the tympanic membrane. The mechanism of the deafness in those cases will be discussed later. Tinnitus varied from mild to severe, with no apparent correlation between its severity and the size of the perforation. It was not uncommon for the tinnitus to be intermittent or even to disappear completely, although this was not the rule. We also saw many patients with a history of perforation of the tympanic membrane due to explosion in whom the perforation had already healed.

In cases in which the ear remained dry, we have attempted to close the central type of perforation by the application of Cargile's membrane. At the time of this writing we have been successful in only a few cases. Not uncommonly, after two to four weeks the applied membrane retracted from the ear drum without any apparent change in the size of the perforation. In cases of chronic otitis media with persiste discharge we attempted to dry up the ear w local treatment and careful attention to a infection of the nose and sinuses, and with ton lectomy and adenoidectomy if these were in cated. While we have not been uniformly s cessful in obtaining a dry ear in every case, improvement has been sufficiently marked eliminate the need for radical mastoidectomy

Until the beginning of 1943 we generally turned the soldier with chronic disease of ear to limited service when the ear became q escent, with the recommendation that he assigned to a fixed installation where he wo not be exposed to inclement weather or sudd changes of weather. At that time, having served the frequency of recurrences necessitat further hospitalizatiin, with consequent loss time, and keeping in mind the potential dan inherent in such chronic infections of the e we adopted the policy, with certain exceptio of discharging such soldiers from the Arm More recently a War Department directive quires that all soldiers with a chronic perfo tion of the tympanic membrane be dischar from the Army, the only exception noted be the soldier whose aural trouble is benign who possesses such unusual abilities that commanding officer requests his retention in service.

Defective Hearing.—Seventy-seven soldi were admitted to the otolaryngologic section w a primary diagnosis of defective hearing. M others, including numerous men with chr infection of the ear and other otolaryngol conditions, had a secondary diagnosis of deafn Only a complete perusal of all the hospital ords would reveal how many hundreds of ti defective hearing was diagnosed on consultat

In the Army, as in civilian life, deafness i most cases insidious in its onset and slo progressive. Many of our patients knew they were hard of hearing long before they w admitted to the hospital; others, failing to h a command or having difficulty in understand the normal conversational voice, realized for first time that their hearing was impaired. O sionally, a soldier related that he was extrem hard of hearing at the time of his induction that tests were never made of his hearing.

We have seen 2 cases of total deafness a ciated with "dead" labyrinths following a epidemic meningitis. A most unusual case that of a 25 year old attorney, recently induc who became deaf during his first day on the range while firing the Springfield rifle. W the onset of the firing, he complained of se

in in both ears. His ears felt full, and he d difficulty in hearing. At the time of his nsfer to O'Reilly General Hospital, three eks after the incident, he was totally deaf in ear, and the other ear on audiometric examtion showed 50 per cent loss of hearing for versational tones. Aural inspection failed to eal any abnormality in the appearance of the mpanic membranes. He was kept at our hosl for two months, during which time he was en neostigmine methylsulfate and large doses vitamins, including thiamine hydrochloride, ramuscularly and intravenously, but there was improvement in hearing. It was our assumpn that his deafness was the result of minute morrhages in the labyrinths, although it med curious that such hemorrhages should low the firing of 30 caliber guns. Since then have seen numerous cases of deafness follow- exposure to the detonation of high explosive mbs. Here I do not refer to those cases in ich the tympanic membrane was ruptured but those in which no changes could be recogd in this membrane. Deafness in these cases, ost always associated with tinnitus, varied m early nerve deafness to severe mixed deafs with little residual hearing. We have no planation for this type of hearing loss except assume that it is due to petechial hemorrhages the inner ear, probably in the organ of Corti. failed to observe any significant improvent in these cases.

Every patient with defective hearing admitted O'Reilly General Hospital has been the subt of complete medical studies. These studies e included audiometric and other hearing tests a soundproof room, inflation of the eustachian es and treatment of any abnormal conditions the nose and nasopharynx as well as of any temic conditions requiring attention. If the ring was below minimal standards for mili- service, or if the hearing loss was believed e progressive and likely to be the basis of a re claim against the government, the soldier been separated from the service. In those s in which hearing was adequate for military ice and the deafness nonprogressive, we have mmended that the soldier be given an assignt where his impaired hearing would not be imental to him and where he would not be osed to loud noises such as that of gunfire.

Miscellaneous Aural Conditions.—This cate- includes a wide variety of conditions, among ch are: tuberculosis of the middle ear; rinthitis; osteoma of the external auditory al (2 cases), successfully removed in each ; stricture of the external auditory canal; acute and chronic furunculosis of the external canal; severe fungous infections of the auditory canal. The fungous infections are of particular interest at this time because of the number of such infections coming to our attention in soldiers evacuated from the southwest Pacific. We have treated these yeast and mold invasions in a variety of ways. We have employed thymol in alcohol, sulfathiazole ointment and salves containing sulfur, salicylic acid and phenol; we have also administered superficial roentgen therapy. By some of these measures alone and by combinations of them, we have obtained uniformly excellent results.

DISEASES OF THE NOSE AND SINUSES

Deviated Nasal Septum.—One of our common surgical procedures has been the submucous resection of the nasal septum. A submucous resection when truly indicated and properly performed is one of the most satisfactory procedures in the otologist's specialty. It was performed seventy-nine times. Considering how very many men have some type of deformity of the cartilaginous or bony septum of the nose, one may see that this comparatively small figure demonstrates conservatism in the selection of patients for operation. We have been guided in our decision to operate by two facts: First, the deflection of the septum was in itself sufficiently marked to produce obstructive symptoms; second, the removal of this deflection would, in the opinion of the examiner, result in sufficient change in the functioning of the nose to relieve the symptoms. We have never operated on an asymptomatic deviation, no matter how marked it may have been. By the same token, we have not operated on any minor deviation, even though there were a multiplicity of associated symptoms obviously not resulting from the deviation. With this conservative approach, we have had uniformly good results from this surgical procedure.

Nasal Polypi.—Many soldiers were seen who had polyps in the nose, but in only 30 cases was removal of the polyps deemed advisable. The decision to operate was based on the factor of returning the soldier to military duty and not on that of symptomatic relief alone. The others, for the most part patients whose polyps were associated with severe allergy and often with suppuration of the sinuses, were of no further use to the Army.

Sinusitis, Acute and Chronic.—Patients with acute sinus infections were, as a general rule, admitted to the medical service. However, a few were admitted to our section. All of them

were treated conservatively, with complete subsidence of the infection in every case.

The incidence of chronic sinusitis is probably not as high in the Army as in a similar age group in civilian life because of the exclusion of persons with the more severe and recurrent types of disease at the induction centers. Nevertheless, the patients who do come to the Army otolaryngologist do not differ in symptoms and findings from those seen by the civilian practitioner. Eighty-one soldier-patients were admitted to O'Reilly General Hospital with a primary diagnosis of chronic sinusitis. Of these, 42 had chronic maxillary sinusitis, 35 chronic pansinusitis and 4 chronic frontal sinusitis. These patients fell into two groups, those with nonsuppurative and those with suppurative sinuses. No form of surgical treatment was ever undertaken in the first group. Their ultimate disposition depended on the causes of their chronic sinusitis, their symptoms, their usefulness to the Army and similar considerations. The second group was given ample opportunity to respond to conservative treatment. When the question of surgical intervention presented itself, the decision to operate hinged on whether operation would restore the soldier to military usefulness.

The numbers of patients undergoing the various types of surgical operations were as follows:

Antral window operation	7
Caldwell-Luc operation	33
External frontoethmoidectomy	8
Intranasal ethmoidectomy	2
Sphenoidectomy	2
Total	52

Our operative results can be described briefly as follows: In each case in which an antral window was made, there was sufficient improvement that no further surgical procedure was considered necessary. In the 33 cases in which a radical operation on the maxillary sinus was required, viz., the Caldwell-Luc operation, there likewise was complete and uneventful recovery. In 1 case in which an external frontoethmoidectomy was done, there was extensive osteomyelitis of the frontal bone, as well as an abscess of a frontal lobe of the brain. Death occurred forty-eight hours after the operation. A patient admitted with a large orbital abscess, which was promptly drained, recovered completely and was returned to duty after external frontoethmoidectomy, performed six weeks after the drainage of the orbital abscess. The other 6 patients on whom this operation was performed made uneventful recoveries and were returned to full duty. In the 2 instances of intranasal ethmoidectomy, both soldiers were improved sufficiently to resume their military duties. Sphenoidectomy w done in 2 cases for diagnostic purposes. O thickened sinus mucosa was found in 1 case, no way responsible for the severe headache which the patient complained. As might expected with this paucity of pathologic cha in the sinus, no improvement followed operati In the second instance sphenoidectomy was d on a patient who presented definite roentgen e dence of a malignant neoplasm invading the b of the skull, suspected of originating in sphenoid sinus. Removal of the anterior w of the sphenoid sinus produced an immedi intranasal drainage of cerebrospinal fluid, no neoplasm was revealed. After three da during which he showed evidence of mening irritation, the drainage of the cerebrospinal fl stopped, and he returned gradually to his p operative status. On the assumption that neoplasm probably originated in the pituit gland, he was transferred to another Army g eral hospital for radiation therapy.

Miscellaneous Conditions.—As in any la otolaryngologic service, many interesting c ditions presented themselves. We have se for example, such varied disturbances as a d tigerous cyst completely filling the antrum, osteoma of the antrum which was so large t it distorted the contour of the face and was c sidered inoperable, atrophic rhinitis in sev patients, a deep roentgen therapy burn of the n and many oromaxillary fistulas. A condition serving special mention was lymphoepitheli of the nasopharynx arising immediately adjac to the orifice of the eustachian tube in a Chin American soldier who presented himself beca of symptoms of stuffiness of one ear. In estingly, quite recently we saw the exact du cate of this lesion in another Chinese-Ameri soldier.

DISEASES OF THE PHARYNX

Tonsillitis, Acute and Chronic.—Patients w acute tonsillitis, like those with acute sinus were regularly admitted to the medical ser rather than to the otorhinolaryngologic sect Most of the patients with chronic tonsillitis quiring tonsillectomy were not admitted O'Reilly General Hospital primarily for that p cedure but for treatment of other conditi The only exceptions were the soldiers from own detachment and from the Medical Dep ment Enlisted Technicians' School, which associated with this hospital. Tonsillectomy done in 281 cases. It was performed for sev chronic tonsillitis, for elimination of foci of in tion in selected cases of arthritis and in cer cases of cardiac disease, as well as in other c

hen it was the considered judgment of the tending medical officers that the operation was dicated. When the evidence for tonsillectomy as not convincing and the resultant improvement highly problematic, we have been reluctant o submit a patient to this surgical procedure. t is not possible to evaluate the results of tonsilectomy in the selected subjects at the present me. The patients seldom remained under our bservation long enough to determine the benefits the absence thereof. The evidence, however, being accumulated for postwar studies which hould influence definitely present conceptions the indications for the surgical removal of nsils.

Miscellaneous Pharyngeal Conditions.—Under is heading there are included such conitions as Vincent's infection of the tonsil and eritonsillar abscess, of which, as might be exected, we have seen numerous instances. It is interest that we have cured most of the paents with quinsy by chemotherapy alone; it was ecessary to incise the abscess on only twelve casions. Many cervical abscesses, two of hich were tuberculous, as well as such varied nditions as persistent thyroglossal duct, anchial cyst and ranula, have come to our tention. One of the most unusual cases was at of a soldier, who fell while walking along d smoking a pipe; the pipe stem was jammed to the posterior pharyngeal wall, breaking in e process. He came to us twenty-eight days ter the accident, seriously ill, with a draining nus in the posterior pharyngeal wall and with gns of meningitis as well as possible thrombosis the cavernous sinus. A review of roentgen ms of the neck taken immediately after the cident revealed the broken off end of the pipe em lodged in the pharyngeal wall just lateral the fourth cervical vertebra, though this had en overlooked in the original reading of the ms. In spite of intensive sulfadiazine therapy er a ten day period, blood transfusions and neral supportive measures, the patient died ring an attempt at removal of the foreign body elf, made when it became apparent that the her measures were unavailing. Autopsy realed the broken piece of pipe stem embedded the paravertebral muscles immediately to the ght of the fourth cervical vertebra, purulent eningitis, and the torcular Herophili completely led with creamy pus.

DISEASES OF THE LARYNX AND TRACHEA

Hoarseness.—We have seen, of coarse, a large mber of patients with hoarseness due to acute ryngitis complicating acute respiratory infection. I shall consider under this heading however, only the 49 soldiers admitted to the hospital whose presenting symptom was chronic hoarseness. The various types of chronic hoarseness were distributed as follows:

Aphonia, hysterical	13
Carcinoma of the larynx	1
Laryngitis, chronic	18
Papilloma of the larynx	15
Paralysis of a vocal cord	2

One soldier had an extensive carcinoma of the larynx, proved by biopsy. Because of obstructive symptoms, tracheotomy was done, and since the lesion was considered inoperable, the patient was transferred to another general hospital for treatment with high voltage roentgen rays. In the 18 patients with a diagnosis of chronic laryngitis we were unable to demonstrate tuberculosis, syphilis or any other chronic infectious granuloma as the cause. After elimination of infection in the nose and throat, and a period of prolonged vocal rest, 14 of them showed sufficient improvement to return to military duty; the remaining 4 were separated from the service. In the 15 instances of papilloma of the larynx, the polyps were removed through a Jackson laryngoscope. Each polyp was examined microscopically, but none of them showed evidence of cancer. Two patients were seen in whom the chronic hoarseness was due to paralysis of one of the vocal cords. Although such etiologic factors as a thickened pleura, a mediastinal mass and lesions of the central nervous system were carefully considered, we were unable to demonstrate any definite cause in either of these cases.

Diseases of the Trachea.—We have seen 2 patients with stricture of the upper part of the trachea secondary to attempted suicide. A most unusual laryngeal lesion was found in a 25 year old officer who was transferred to O'Reilly General Hospital in the spring of 1943.

While in combat in Guadalcanal on Dec. 19, 1942, he was shot through the jaw from a distance of 15 yards (13.5 meters). The bullet entered at the angle of the mandible on the left side, and its point of exit was at the angle of the mandible on the opposite side. Tracheotomy was done on the field of battle, presumably immediately after he was shot, although he lost consciousness and has no recollection of it. After evacuation through several hospitals, receiving treatment in the meantime, he eventually reached O'Reilly General Hospital in April 1943.

He stated that for six weeks after the tracheotomy he could blow air into his pharynx by closing the tube, although this was accomplished with increasing difficulty. After that he could not force any air through his larynx and was unable to utter a sound.

When we saw him, there was a high tracheotomy tube in place. If the tube was closed, he immediately began to struggle for air. The ascending portion of the ramus

of the mandible on each side had been shattered; considerable bone was missing, although the overlying skin and the mucosa of the cheek were healed. The bullet had apparently accomplished removal of the tonsils, at the same time removing a part of the soft palate, since, although the soldier steadfastly denied ever having had his tonsils removed, no recognizable tonsil tissue was present and both tonsillar fossae were scarred. Because of the configuration of the mandible, both direct and indirect laryngoscopy were unsatisfactory; we were unable to recognize an epiglottis or any opening into the larynx. After a period of observation, it was decided to explore his larynx, doing thyrotomy if necessary, although, as will be seen, the latter procedure was never required. The tracheotomy tube was moved from the region of the cricothyroid membrane to a lower position. An attempt was made to examine the larynx by inserting a laryngoscope through the old tracheotomy opening and directing it upward. The vocal cords appeared normal, but one was unable to see above them. With dilators being used from below, an opening was made through the upper end of the larynx, and dilation was continued until it was possible to place a no. 5 Jackson tracheotomy tube in an inverted position, so that the tip was directed upward through the larynx and presented itself in the pharynx. Once this was accomplished, a two way tracheotomy tube was inserted. It was removed after seventy-two hours because of marked discomfort from the tube, failure to eat, difficulty in swallowing saliva and generally poor condition of the patient, only a low tracheotomy tube being left in place. He immediately began to utter sounds, and at the end of one week he spoke with a fairly good voice. One month later the tracheotomy tube was corked, and after a further period of observation it was removed. The wound in the neck healed uneventfully, and now, five months after admission to this hospital, he speaks with a normal voice and breathes normally, and this after several previous observers had given their opinion that he would never be able to speak again. Plastic repair of his mandible is being effected.

BRONCHOSCOPY

Because of the allocation of general hospitals as consulting centers in the Army program for specialized and definitive medical care, and because of Army directives limiting the length of time that patients may be kept in station hospitals, many patients with chronic pulmonary disease reach these institutions. As a corollary to this, bronchoscopy comprises a large and important part of the work of the otorhinolaryngologic sections of these hospitals. For these reasons, the proportion of cases in which bronchoscopy is done to cases in which any other otorhinolaryngologic procedure is done is higher than in civilian hospitals of similar scope. We have done bronchoscopy in 77 cases. In all these it was done for diagnostic or therapeutic purposes—in no instance for removal of a foreign body. In 2 cases bronchogenic carcinoma was found. In 1 instance a diagnosis of pulmonary coccidiosis was established by biopsy of tissue removed through the bronchoscope, and on two occasions a pulmonary abscess was drained by this same route. In the remaining cases the diagnosis was bronchiectasis or chronic bronchitis, with many instances in which no disease of the tracheobronchial tree could be demonstrated. We did not use the bronchoscope in cases of pulmonary tuberculosis, nor did we treat bronchiectasis by repeated bronchoscopy.

We might add in passing that esophagoscopy was occasionally performed for diagnostic purposes, and in 3 instances a foreign body was removed from the esophagus.

Consolidated Report of the Otorhinolaryngologic Section of O'Reilly General Hospital from Nov. 8, 1941 to Sept. 1, 1943

1. Number of soldier-patients admitted to section	1,[illegible]
2. Number of otorhinolaryngologic consultations	7,[illegible]
3. Number of visits to the otorhinolaryngologic clinic	27,[illegible]
4. Classification of patients admitted to otorhinolaryngologic section:	
(*a*) Patients admitted because of ocular disease	312
(*b*) Patients admitted because of disease of ear, nose or throat	864
Abscess, brain	1
Abscess, cervical	5
Abscess, cervical, tuberculous	2
Abscess, forehead	1
Abscess, mastoid process	1
Abscess, peritonsillar	8
Actinomycosis	1
Angina, Vincent's	9
Aphonia, hysterical	13
Asthma, bronchial	3
Atrophy, cerebral	1
Bronchiectasis	2
Bronchitis	1
Carcinoma, larynx	1
Cellulitis, neck	4
Cephalgia	2
Cyst, branchial	2
Cyst, dentigerous	1
Cyst, ranula	1
Cyst, thyroglossal	1
Defective hearing	77
Deformity, nose	9
Deviation of nasal septum	76
Epistaxis	1
Fistula, oromaxillary	3
Foreign body in esophagus	3
Foreign body in face	1
Foreign body in neck	1
Fracture, frontal sinus	1
Fracture, malar bone	6
Fracture, mandible	2
Fracture, nose	3
Fracture, skull	2
Furuncle, nose	1
Hemoptysis	1
Infectious mononucleosis	1
Irradiation reaction, roentgen ray	1
Labyrinthitis, chronic	2
Laryngitis, chronic	18
Mental deficiency	1
Nasopharyngitis, acute	8
Neoplasm, base of skull, malignant	1
Neoplasm, nasopharynx, malignant	2
Neoplasm, pharynx, type undetermined	1
Osteoma, external auditory canal	2
Osteoma, maxilla	1
Osteomyelitis, mandible	3
Otitis externa	9
Otitis media, acute, with or without mastoiditis	52
Otitis media, chronic, with or without mastoiditis	82
Pansinusitis	35
Papilloma, laryngeal	15
Paralysis, facial nerve	2
Paralysis, vocal cord	2
Pneumonia	1
Polypus, aural	1
Polypus, nasal	17
Post-traumatic head syndrome	3

Psychoneurosis..... 6
Psychopathic personality, constitutional.... 3
Rhinitis, allergic..... 20
Rhinitis, atrophic..... 1
Salpingitis, eustachian..... 5
Sinusitis, frontal..... 4
Sinusitis, maxillary, acute..... 16
Sinusitis, maxillary, chronic..... 42
Stricture, auditory canal, external..... 1
Stricture, larynx, secondary to gunshot wound..... 1
Stricture, trachea..... 2
Syphilis..... 1
Tinnitus aurium..... 1
Tonsillitis, follicular, acute..... 4
Tonsillitis, follicular, chronic.....244
Ulcer due to radiation..... 1

(c) Patients in whom no disease of ear, nose or throat was found..... 5

Number of minor surgical procedures performed in otorhinolaryngologic clinic 706

(a) Procedures on eye..... 99
(b) Procedures on ear, nose or throat..... 667

Antral irrigation.....587
Biopsy, larynx..... 1
Biopsy, nose..... 1
Electrocoagulation, nasal septum..... 4
Excision of sebaceous cyst..... 2
Incision and drainage of abscess of parotid gland..... 1
Incision and drainage of auricular abscess... 2
Incision and drainage of cervical abscess.... 1
Incision and drainage of facial abscess..... 2
Incision and drainage of peritonsillar abscess 12
Incision and drainage of septal abscess..... 2
Paracentesis, tympanic membrane..... 37
Polypectomy, aural..... 1
Polypectomy, nasal..... 9
Reduction of fracture of nose..... 2
Removal of calculus from submaxillary duct 1
Removal of tumor from lip..... 1
Removal of verruca from nasal vestibule.... 1

Number of otorhinolaryngologic operations (in operating room) 811

(a) Operations on eye..... 134

(b) Operations on ear, nose or throat..... 677

Adenoidectomy..... 11
Antral window operation..... 7
Biopsy, cervical gland..... 2
Biopsy, nasopharynx..... 2
Bronchoscopy..... 77
Caldwell-Luc operation..... 33
Dilation for cardiospasm..... 2
Electrocoagulation, turbinates..... 1
Esophagoscopy..... 10
Ethmoidectomy, external..... 8
Ethmoidectomy, intranasal..... 2
Excision of osteoma from auditory canal... 2
Excision of sebaceous cyst..... 2
Exploration, carotid sheath..... 1
Exploration, orbit..... 1
Exploration, temperomandibular joint..... 1
Frontal sinusotomy..... 3
Incision and drainage of abscess
forehead..... 1
mandible..... 3
mastoid process..... 1
neck..... 2
orbit..... 1
parotid gland..... 1
septum..... 1
temporal fossa..... 1
Insertion of two way tracheotomy tube..... 1
Laryngoscopy, direct..... 32
Laryngotomy..... 1
Mastoidectomy..... 9
Paracentesis, tympanic membrane..... 30
Plastic operation, external auditory canal... 2
Plastic operation, nasofrontal duct..... 1
Plastic operation, tympanic membrane..... 2
Polypectomy, aural..... 1
Polypectomy, laryngeal..... 15
Polypectomy, nasal..... 21
Reduction of fracture, maxilla..... 4
Removal of foreign body from face, attempted..... 1
Removal of two way tracheotomy tube..... 1
Repair of laceration of nose..... 1
Repair of oromaxillary fistula..... 2
Rhinoplasty..... 9
Secondary closure of tracheotomy wound... 1
Sequestrectomy, malar bone..... 1
Sphenoidectomy..... 2
Submucous resection..... 79
Tonsillectomy.....281
Tracheotomy..... 3

7. Diagnostic procedures:
(a) Audiograms made 459
(b) Bronchograms made 138

8. Number of deaths..... 3
(a) Sgt. Foreign body, end of pipe stem, in posterolateral pharyngeal wall, with secondary meningitis
(b) Pvt. Osteomyelitis of frontal bone and abscess of brain
(c) Pvt. Osteomyelitis of mandible and base of skull; thrombosis of lateral sinus

SUMMARY

Military considerations govern the treatment and disposition of patients in Army general hospitals.

The entire field of otorhinolaryngology has passed in review at O'Reilly General Hospital from its establishment to the present, and many cases of extraordinary interest have been encountered.

An accurate picture of the practice of otolaryngology in this hospital in the present world war enables one to view it properly in its historical sequence in the progress of the medical care of the soldier.

THE BÁRÁNY AND GALVANIC TESTS

THEIR VALUE IN THE DIAGNOSIS OF LABYRINTHINE AND INTRACRANIAL DISEASE IN THE PRESENCE OF SUPPURATIVE OTITIS MEDIA

BURECH RACHLIS, M.D.
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It is my purpose to present 3 cases in which the vestibular tests were of distinct aid in establishing a neurotologic diagnosis in the face of conflicting neurologic signs and symptoms, and 1 instructive case of tumor of the cerebellopontile angle in which the vestibular findings were suggestive of the lesion but unfortunately were misinterpreted.

REPORT OF CASES

CASE 1.—R. K., a girl 12 years old, in the service of Dr. S. F. Gilpin, Jr., Temple University Hospital, had double vision, frontal headache, nausea and vomiting of five weeks' duration following German measles. During the course of the measles she had a mild earache first in the left and later in the right ear.

Neurologic examination by Drs. Alexander Silverstein and Paul Sloane disclosed bilateral palsy referable to a disturbance of the sixth nerve, external deviation and pronation of the right arm, slight asynergy with a mild Gordon-Holmes sign, hypotonia of the lower limbs with cerebellar incoordination bilaterally, subdued deep reflexes, an equivocal Babinski sign on the left side, paradoxic Oppenheim and Babinski signs on the left side, tenderness over the ri mastoid process and bilateral choked disk (3 diopte —findings predominantly cerebellar.

Roentgen examination of the mastoid portion of t temporal bone demonstrated marked and diffuse und aeration of the cells on the right side (fig. 1).

The Bárány tests (fig. 2) suggested a supratento lesion, most likely of otitic origin, an epidural absc an abscess of the temporosphenoid lobe or a les of the occipital lobe, since the past pointing w exaggerated and since the patient was moderately s ceptible to aural stimulation; a cerebellar hemisphe lesion was ruled out for the same reasons.

The drumhead of the left ear was retracted but w otherwise normal. The drumhead of the right ear w

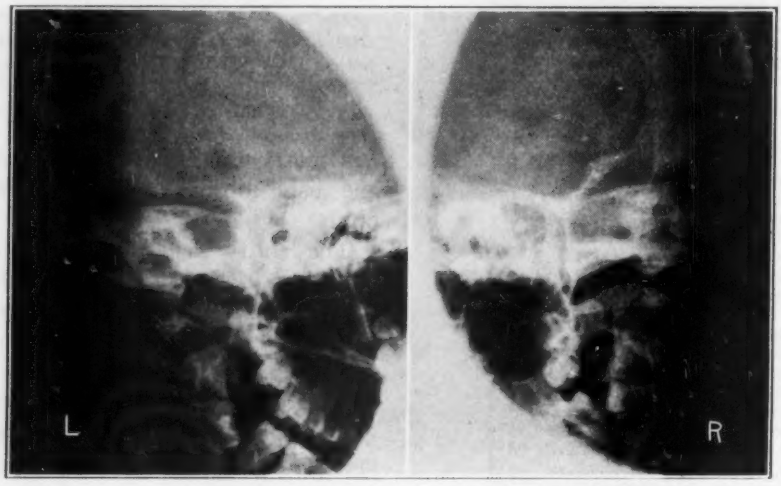

Fig. 1 (case 1).—Roentgenograms of the mastoid bones.

bulging and pulsating. Myringotomy was done, a a moderate amount of sanguinopurulent discharge w evacuated. There was tenderness over the emiss vein.

The patient was transferred to Dr. M. S. Ersn service, and simple mastoidectomy was done five d after the myringotomy. The findings were frank p marked necrosis of bone, perisinuous abscess and thro bosis of the lateral sinus from the torcular end to bulb of the jugular vein.

The patient made an uneventful recovery and w discharged about five weeks postoperatively.

Comment.—An abscess of the temporosphen lobe was ruled out neurologically since there w no homonymous or quadrant hemiopsia and

Read before the Philadelphia Laryngological Society on Nov. 15, 1944.

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sory aphasia.[1] A cerebellar hemispheric lesion s made improbable by the Bárány tests since patient was moderately susceptible to aural mulation and since exaggerated responses, ticularly past pointing, were elicited on turn- tests, suggesting also involvement of the ipital lobe.

Jones and Fisher[2] have found exaggerated t pointing with turning tests in cases of tumor the occipital lobe.

In the case just presented the exaggerated t pointing was most likely due to the thrombus sing pressure on the cerebellum or to the neurologic findings on the basis of thrombophlebitis in that portion of the lateral sinus.

The choked disks in this case were due to stasis as a result of the thrombosis of the lateral sinus interfering with the normal circulation of the inferior petrosal sinus. Blau, Friesner and Lillie have found that ligation of the jugular vein causes papilledema.[3]

The bilateral palsy referable to a disturbance of the sixth nerve could have been caused by the increased intracranial pressure on the pons, in cavernous sinuses or in canals of Dorello produced by inflammatory edema.

Name Miss R. K. Age 12 Date April 23rd, 1943 Referred by Dr. Gilpin.

Dizziness-None; Tinnitus-?; Deafness-None; Staggering-?

SPONTANEOUS PHENOMENA

Nystagmus		Pointing	
Looking right ←	Romberg-Sl,Swaying	Right Arm	Left Arm
Looking left →	Turning head to right-no effect	2" to R-T	2" to R-T
Looking up ↑ ?	Turning head to left--no effect		
Looking down-none	Pelvic Girdle movements-good	not constant	
Looking ahead-none			

TURNING TESTS

Nystagmus		Past	Pointing
To right →	Vertigo		
Duration-28 sec.	35 Falling to R-	24" to R	24" to R
Amplitude-med.-large, med.	Seconds marked	16" to R	12" to R
To left ←		8" to R	6" to R
Duration-31 sec.	19 Falling to L-	T	T
Amplitude-med-large,	Seconds marked	24" to L	24" to L
med-rapid	pallor, vomited	16" to L	12" to L
		8" to L	6" to L

CALORIC TESTS

Right ear		T	6" to R
Verticals ↷	Seconds		
After-2 min., 10 sec., sl. improved after 3 min.			
Amp.-small, slow		2" to R	6" to R
Head back →			
Amp.-med. slow			
Left ear			
Verticals ↶	Seconds		
After 1-3/4 min.			
Amp.-small, med.-rapid (better)		6" to L	10" to L
Head back ←			
Amp.-med.-large,med., better		16" to L	16" to L
Ears:-A.D. (Bulging & pulsation)	Nausea	Hearing appears good bilaterally,slightly	
A.S. Retracted	Sl. moist	better on left.	

Fig. 2 (case 1).—Record of the vestibular examination. C. S. O. M. means chronic suppurative otitis media.

ammatory reaction of the lower wall of the ral sinus, which is really a part of the tenum cerebelli, rather than the involvement of upper wall of the sinus, which is in contact the occipital lobe. The fact that the lateral s from the torcular to the upper knee, the nning of the sigmoid sinus, lies between the pital lobe above and the cerebellum below ld explain the predominating cerebellar

CASE 2.—R. H., a woman aged 22 years, in the service of Dr. Michael Scott, Temple University Hospital, complained of constant supraorbital headache on the left side and of backache of two weeks' duration.

About five weeks prior to examination the patient was admitted to the Bridgeton Hospital, Bridgeton, N. J., unconscious after an automobile accident. When she regained consciousness, she noticed bleeding from the left ear and markedly impaired hearing on the same side. She was treated as having a skull fracture, and after two weeks she was sent home improved. Four days later she was readmitted to the same hospital and then transferred to Temple University Hospital.

Neurologically, she presented signs of a lesion of the cerebellopontile angle on the left, probably a hema-

1. McDonald, J. F.: Recent Developments in Diag- of Intracranial Lesions with Special Reference e Usual Pathways, Tr. Am. Acad. Ophth. **33**:39,

2. Jones, I. H., and Fisher, L.: Equilibrium and igo, Philadelphia, J. B. Lippincott Company, 1918.

3. Fischer, J., and Wolfson, L. E.: Inner Ear, New York, Grune & Stratton, Inc., 1943.

toma. The neurologic findings were generalized irritability, facial hypalgesia, diminished corneal reflex, partial peripheral facial palsy and deafness, all on the left side. The reflexes were hyperactive, more so on the right, with a positive Hoffmann sign on the right, choked disk (1 diopter) and mild stiffness of the muscles of the neck.

On the following day a vestibular examination was done. The turning tests could not be carried out, owing to the patient's disabled condition. The caloric tests could be done only on the intact right ear, which gave a slightly hypoactive response. The caloric tests could not be carried out on the left ear since there was a traumatic perforation and a thin seropurulent discharge following suspected skull fracture, so that the galvanic unipolar test worked out by Mackenzie [4] was resorted to.

the impaired hearing, mostly conductive in type, a
the negative findings with the galvanic test except
mild irritability of the left vestibular nerve sugges
a longitudinal fracture of the petrosa with possi
petechial hemorrhages into the facial nerve and
semilunar ganglion or with microscopic fissures
those areas to explain the involvement of the seve
and fifth nerves, the fracture line possibly going thro
the floor of the middle fossa. Mastoidectomy was s
gested to divert the middle ear drainage from
fracture line path intracranially to the exterior. R
tine roentgen examination of the skull and the mast
process failed to demonstrate a skull fracture
indicated underaeration of the left mastoid process.

Another roentgen examination done with the pati
in the Stenver and Bullitt positions demonstrated
short fracture line passing obliquely through the sq

Name Mrs. R.H. Age 22 Date June 10th, 1943 Referred by Dr. Scott.

Dizziness-None; Tinnitus-Yes; Deafness-Impaired hearing in left;

Staggering — SPONTANEOUS PHENOMENA

Nystagmus — Pointing

Looking right-none — Romberg — Right arm, Left arm

Looking left-none — Turning head to right

Looking up-none — Turning head to left — 2" to L, 2" to L

Looking down-none — Pelvic Girdle Movements

Looking ahead-none — Cooperation-4

GALVANIC TESTS

Nystagmus → — Vertigo — Past Pointing

To right ↷

5 milliamperes

Amplitude- Med. med. — Seconds — Anode-stimulating electrode

To left ↶ — Unipolar method

4 milliamperes — Seconds

Amplitude- Med. med.

CALORIC TESTS

Right ear

Verticals ↷ — Seconds

After-50 sec.

Amp.- Med. med.

Head back

Amp.- Med. med.

Left ear

Verticals — Seconds

After

Amp.

Head back

Amp.

Ears:- A. D.

A. S. Perforated and discharging. Hearing impaired, mostly conductive.

Fig. 3 (case 2).—Record of the vestibular examination. C. S. O. M. means chronic suppurative otitis m

With the galvanic test there were good responses from both vestibular nerves; the better response was elicited from the left ear—the diseased ear. The nystagmus was of the horizontal-rotatory type. The hearing impairment was mostly conductive.

It was obvious from the galvanic test that a lesion of the cerebellopontile angle as well as a transverse fracture of the petrosa involving the membranous labyrinth could be ruled out. When the anode was used as the stimulating electrode, nystagmus to the opposite side was observed.

The history of suspected skull fracture, the traumatic perforation of the tympanic membrane with bleeding,

mous portion of the temporal bone immediately be
the temporomandibular joint and extending thr
some of the anterior mastoid cells present in the squ
temporalis. A myelogram indicated a block at
first lumbar interspace. This accounted for the
tient's severe backache and the inability to obtain
than a few drops of cerebrospinal fluid, which co
lated promptly.

Within seven days the choked disk increased
diopters, the left corneal reflex was entirely al
and the nuchal rigidity increased, which clinically
peared to be due to an epidural abscess and menin
complicating a lesion of the cerebellopontile angle.

Simple mastoidectomy performed at this time
closed necrotic bone and granulation tissue in
mastoid process. The cerebral and the cerebellar

4. Mackenzie, G. W.: Galvanic Tests of the Internal Ear, Laryngoscope **27**:200, 1917.

d the lateral sinus were exposed and appeared nor-al. The pathologic report was chronic osteomyelitis the mastoid process.

Immediately after the mastoidectomy and continuaon of the treatment with sulfonamide drugs there gan to be improvement; the symptoms and signs ppeared, and the patient made an uneventful overy.

Comment.—Neurologically this patient preted at first a fairly typical symptom complex a lesion of the cerebellopontile angle. The

Fig. 4 (case 2).—Roentgenogram of the mastoid bones with the patient in the Bullitt position.

ig 5 (case 2).—Roentgenogram of the left petrosa the patient in the Stenver position.

vanic test ruled it out and suggested a longiinal fracture of the petrosa rather than a nsverse fracture involving the labyrinth.

The longitudinal fracture of the petrosa is most common (in about 80 per cent) and due to the fact that the areas of weak bone close to the compact labyrinthine capsule. According to Fischer and Wolfson,[3] the typical fracture line is in the front of the upper margin of the pyramid (middle cranial fossa). It involves the roof of the middle ear—the tegmen tympani and antri—extending medially to the gasserian ganglion and laterally to the squama and the mastoid process or through the external auditory meatus. Involvement of the middle and the external ear leads to dislocation of the ossicles and usually results in rupture of the drum membrane with hemorrhages. Hemorrhages occur not only in the region of the fracture line, i. e., in the middle and the external ear, but also in such parts of the inner ear as the internal auditory meatus, the bony nerve channels, the cochlear aqueduct and the perilymphatic spaces of the cochlea and the labyrinth.

Microscopic fractures and fissures have been described by Scheibe and Nager on the basis of histologic examination. Other fractures are transverse and combined.

The galvanic test proved its usefulness in this case. It is also useful in cases of atresia or of exostotic or polypous blockage of the external auditory canal as well as in cases in which it is necessary to differentiate a labyrinthine from a retrolabyrinthine lesion when the Bárány tests fail to elicit any responses.

Case 3.—A. C., a woman 27 years of age, in the service of Dr. M. S. Ersner, suffered from dizziness and headache of six weeks' duration. Three weeks prior to this attack she had chills and fever, tired easily, felt weak, had cardiac palpitation and shortness of breath. She had lost 26 pounds (12 Kg.) in weight.

Her illness was recurrent, beginning six years back, at which time she had a severe attack of rotational vertigo. Light nauseated her and made her vomit. She was admitted to a local hospital and was treated there for acute suppurative otitis media, which cleared up, and the labyrinthine symptoms subsided.

During the five years prior to her third admission to Dr. Ersner's service she had several exacerbations of the chronic suppurative otitis media accompanied by vertigo. Three years before, mastoidectomy was

performed on the right side, and two years before, secondary mastoidectomy on the same side for the recurrent attacks. Following these operations, while her aural discharge persisted she got along fairly well, but as soon as the aural discharge stopped she became dizzy and nauseated and had headaches, chills, fever, palpitation and dyspnea.

At the time of the first mastoidectomy it was suspected that she had a cerebellar abscess.

skull demonstrated a sclerosing left mastoid proce and the operative defect on the right side—the si of the actively diseased ear.

Hearing was impaired bilaterally, more in the rig ear, and was mixed and obstructive in type. T findings with the Bárány tests were suggestive bilateral degenerative labyrinthitis rather than of cerebellar lesion.

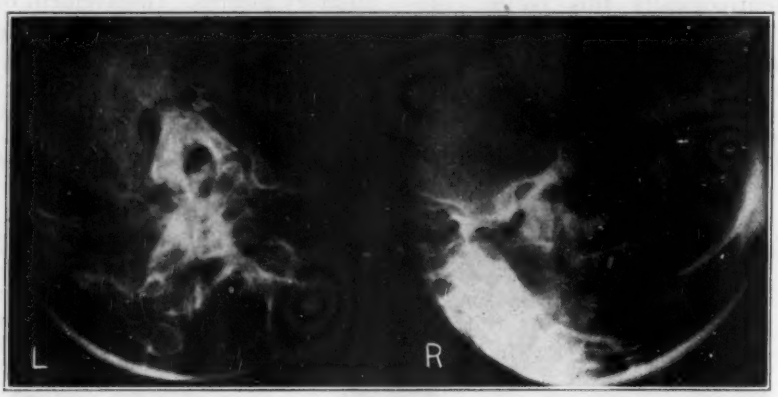

Fig. 6 (case 3).—Roentgenogram of the mastoid bones.

Name Miss A. C. Age 27 Date Sept. 24th, 1943 Referred by Dr. Ersner

Dizziness Tinnitus-Rt. Deafness-Rt. Staggering-at times

SPONTANEOUS PHENOMENA

		Pointing	
Nystagmus			
Looking right ←	Romberg-Falls backward & to Rt.	Right Arm	Left Arm
Looking left →	Turning head to right " "	2" to R	4" to L
Looking up-none	Turning head to left " Left		
Looking down-none	Pelvic Girdle Movements-unsteady		
Looking ahead-none			

TURNING TESTS

Nystagmus	Vertigo	Past	Pointing
To right →	10	8" to R	6" to L
Duration-12 sec.	Seconds	4" to R	4" to L
Amplitude-med., med.		8" to R	6" to L
To left ←	8	8" to R	T
Duration-15 sec.	Seconds	6" to R	8" to L
Amplitude-med., med.		6" to R	8" to L cont.

Pallor, perspiration, vomited, CALORIC TESTS

Right ear		2" to R	2" to L
Verticals ↷	Seconds		
After-25 sec.			
Amp.-med., med.		2" to L	T
Head back →			
Amp.-med., med.			
Left ear			
Verticals ↶			
After-90 sec.	Seconds	12" to L	8" to R
Amp., Small, med.	Vomiting		
Head back ←			
Amp.-med., med., not as good (fibrillary & rapid)		12" to L	12" to L

Bilateral obstructive partial deafness more on rt., mixed

Ears:- A.D.-C.S.O.M. (Rt. mastoidectomy)

A.S.-C.S.O.M. dry

Fig. 7 (case 3).—Record of the vestibular examination made before operation. C. S. O. M. means chronic s purative otitis media.

At the time of her third admission to Dr. Ersner's service at Temple University Hospital she had been free from symptoms of sepsis during the past six weeks, but her vertigo persisted.

Complete physical and neurologic examination failed to disclose any abnormality. A roentgenogram of the

The right mastoid process was revised once m and a contracted mastoid cavity was found. The d in the middle and posterior fossae was exposed appeared normal. The oval and round windows w easily visualized. A small amount of granulation tis was removed from the cavity in the mastoid proc

nd from the middle ear. An opening was drilled in he promontory and four to five drops of 95 per cent lcohol was injected into the perilymphatic space.

On the next day the vertigo was more marked. There was mild spontaneous horizontal nystagmus of irst degree to the right—toward the operative ear—nd marked spontaneous horizontal nystagmus to the eft on left lateral gaze. On upward gaze there was lefinite spontaneous vertical nystagmus upward fol-owed by rotatory nystagmus to the left.

Eight days postoperatively the spontaneous vertigo nd nystagmus had subsided completely, and three days ater the patient left the hospital symptom free. Nine nonths later she was still free from vertigo and was ractically well except for an ailment of the kidneys. The right labyrinth was totally destroyed as evidenced by the findings in the vestibular tests.

cat bilaterally and observed spontaneous vertical nystagmus downward. They concluded on the basis of this competent scientific investigation that spontaneous vertical nystagmus of peripheral origin is possible.

According to Jones and Fisher [2] and Fischer and Wolfson,[3] vertical nystagmus is pathognomonic of the central lesion resulting from a diseased condition of the vestibular nuclei in the brain stem brought on by pressure of a cerebellar abscess, neoplasm, trauma or any other pathologic condition along the central vestibular pathways. Spontaneous vertical nystagmus appearing in the presence of an abscess of the tem-

Name Miss A. C. Age 28 Date June 13th, 1944 Referred by Dr. Ersner

Dizziness Tinnitus Deafness Staggering

SPONTANEOUS PHENOMENA

Nystagmus		Pointing	
Looking right ←	mild Romberg-Sl. swaying more to R	Right Arm	Left Arm
Looking left →	mild Turning head to right-Back and to R.		
Looking up-none	Turning head to left-Forward and to L.	T	T
Looking down-none	Pelvic Girdle Movements-Sl. unsteadiness to L.		
Looking ahead-none			

Sl. Pallor

TURNING TESTS

Nystagmus	Vertigo	Past Pointing	
To right →	8 Falling to R	2" to L	2" to L
Duration-4 sec.	Seconds very mild	T	T
Amplitude-Med., med.		T	2" to L
To left ←	12	T	T
Duration-6 sec.	Seconds Falling to L.	T	T
Amplitude-Med., med.	V. Mild	T	T

CALORIC TESTS

Right ear

Verticals-occ. Seconds

After-5 min.

Amp.-V. Small

Head back-none

Amp.

Left ear

Verticals Seconds

After-90 sec. improved after 2½ min.

Amp.-Small-med., slow-med.

Head back ←

Amp.-Med., med.-rapid

Ears:- A.D. Radical mastoidectomy well healed-Deaf Bone Cond. dim. Weber to L.

A.S. Large perforation, dry. Hearing is fairly good. Bone Cond. louder

Fig. 8 (case 3).—Record of the vestibular examination made nine months after last operation.

Comment.—This case is presented not only ecause the findings with the Bárány tests sug-sted a peripheral lesion and ruled out a erebellar lesion but also because the incidental inding of spontaneous vertical nystagmus after lcohol had been injected into the perilymphatic pace through an opening in the promontory orroborated clinically the experimental work ne on the cat by Spiegel and Scala.[5]

Spiegel and Scala [5] injected a 2 per cent solu-n of a cocaine salt into the middle ear of the

porosphenoid lobe indicates that the abscess has ruptured into the ventricular system.

Leidler contended on the basis of experimental studies that vertical nystagmus is the result of disease or injury of the cephalad portion of Deiters' nucleus and arcuate fibers leading to the posterior longitudinal bundle.

Spontaneous vertical nystagmus is of an intracranial origin in the great majority of cases. However, in the presence of a history of Ménière's symptom complex of peripheral origin and the absence of positive findings from a neurologic examination and studies of the eyegrounds one should not hesitate to make a diagnosis of a peripheral lesion on the basis of the

5. Spiegel, E. A., and Scala, N. P.: Vertical Nys-gmus Produced by Peripheral Labyrinthine Lesion, be published; Response of Labyrinthine Apparatus Electrical Stimulation, Arch. Otolaryng. **38**:131 Aug.) 1943.

experiments of Spiegel and Scala, subject to observation of the patient over a reasonable period.

The established fact that circumscribed labyrinthitis of the horizontal canal occurs tends to show that an isolated lesion confined to one or more vertical canals, irritative or destructive, can also occur as result of contiguous infection or invasive disease of the middle ear or of the presence of emboli or thrombi in the vascular channels of the affected vertical canal or canals.

One does not observe the pathologic changes in the vertical canals as readily as those in the horizontal canals since the vertical canals are deeply situated and not as readily accessible.

the forehead to the right eye. Three weeks prior examination there had been an episode of vomiting.

Examination by members of the neurologic and neurosurgical staffs, Drs. S. F. Gilpin, Jr., Michael Sc and H. T. Wycis, revealed the following abnormalities

The patient was extremely worried, irritable, appr hensive and forgetful; she showed marked lack attention, especially during examination. There w a wide ataxic gait with falling to either side. T head was slightly inclined to the right. The rig pupil was slightly larger than the left. The lig reflex was sluggish, better on the left side. Acu choking of the disk was present. The corneal refle was absent on the right, and there was a small pat of loss of the sensations of pain, touch and temper ture over the right cheek, corresponding to the distr bution of the inferior alveolar nerve. However, t entire right side of the face showed hypalgesia a

Name Mrs. H. F. Age 54 Date March 13th, 1944 Referred by Dr. Gilpin

Dizziness Tinnitus Deafness Staggering

SPONTANEOUS PHENOMENA

Nystagmus
Looking right-none
Looking left-none
Looking up-none
Looking down-occ ↶
Looking ahead-none

Romberg-unable to test for
Turning head to right
Turning head to left
Pelvic Girdle Movements

Pointing
Right Arm Left Arm

Very uncooperative

Sl. pallor

TURNING TESTS

Nystagmus
To right →
Duration-12 sec.
Amplitude-large med.
To left ←
Duration-11 sec.
Amplitude-large med.

Vertigo
unable to test
Seconds

Seconds

Past Pointing
Coop.-0

Nausea

CALORIC TESTS

Right ear
Verticals-none
After-5 min
Amp.
Head back-none
Amp.
Left ear
Verticals ↶↷
Aftef-25 sec.
Amp.- Large, med.
Head back ←
Amp.-Large, med.

Seconds

Uncooperative

Ears:- A.D.-C.S.O.M. active T F 512, Hartman Series, no air.Conduction B.C. present
A.S.-C.S.O.M. dry, A. C., diminished Weber to Rt. " " -(Rinne)+

Fig 9 (case 4).—Record of the vestibular examination. C. S. O. M. means chronic suppurative otitis me

Case 4.—H. F., a woman 54 years old, in the service of Dr. S. F. Gilpin Jr., Temple University Hospital, was admitted with a history which dated back three years to progressive onset of deafness in the right ear, which at the time of examination was nearly complete. There had been episodes of ringing in the right ear, but the patient was uncertain as to the time of onset.

About ten months before examination she was operated on for a fibroid uterus. Following this operation, attacks of dizziness developed in which she would fall to the ground. These attacks lasted only a few minutes, and the patient noticed ringing in her right ear, some return of hearing between attacks, and numbness in the right cheek which remained constant. Her gait became unsteady after the operation, and she would fall to either side.

Recently there had been frontal headaches and suboccipital discomfort on the right side radiating up over

thermohypoesthesia. There was peripheral weakn of the right side, especially of the right lower th of the face, with slight delay in the wink reflex. Th was eighth nerve deafness on the right; the tuning f tests were unreliable. The gag reflex was absent laterally, with deviation of the tongue to the right. M dysmetria was shown by the finger to nose test, discrepancy on the right being larger than that on left. The deep tendon reflexes were hyperactive, m so on the right. There was mild adiadokokinesis on right. Ataxia was more pronounced in the lower lim and the trunk.

The diagnosis was acoustic neurinoma.

After this examination, while the patient was in roentgenology department an attack of jacksonian e lepsy developed, involving the right side of the f and the right arm and leg, which suggested the pos bility of a lesion of the left frontal lobe.

Examination of the eyegrounds by Dr. G. S. Gibson disclosed acutely choked disks (3 diopters); secondary venous thrombosis had produced hemorrhages.

Otologic examination revealed bilateral chronic suppurative otitis media, arrested on the left but active on the right side. Tuning fork tests indicated bilateral mixed deafness. There was complete loss of air conduction with diminished bone conduction on the right side and partial mixed deafness with diminished bone conduction on the left side, with sound lateralizing to the right, the actively diseased side, in the Weber test. On vestibular examination an occasional spontaneous inconstant rotatory nystagmic movement to the right on right lateral gaze was observed. The patient was uncooperative with regard to tests for ataxia and past pointing.

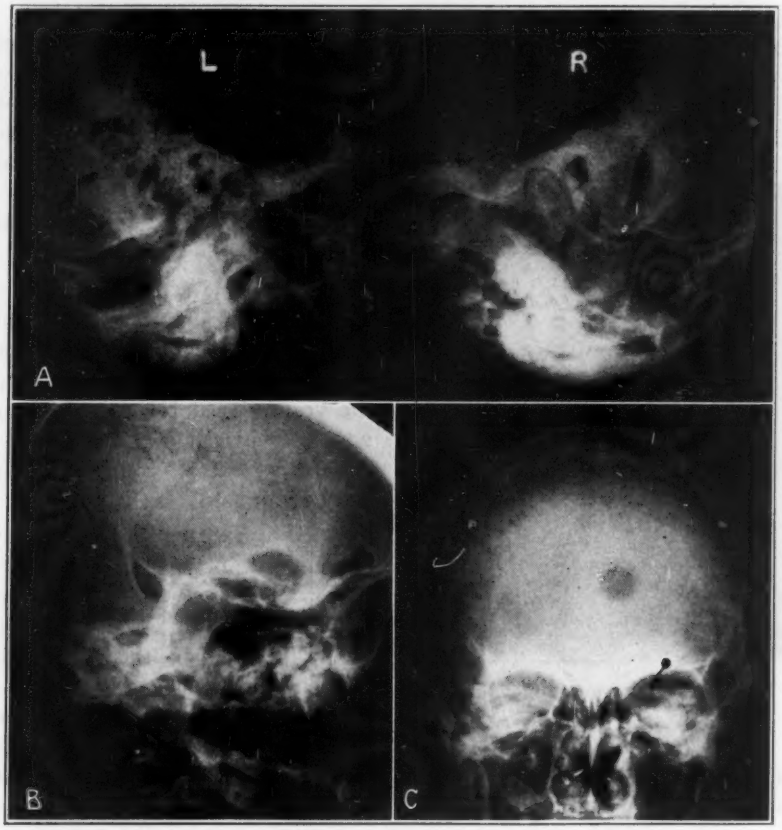

Fig 10 (case 4).—*A*, roentgenogram of the mastoid bones. *B*, roentgenogram of the right petrosa with the patient in the Stenver position. *C*, roentgenogram of the the petrosas showing slight enlargement of the right internal auditory meatus.

On turning tests there was more than a moderate increase in duration of nystagmus bilaterally. The tests for vertigo, falling and past pointing could not be carried out.

On caloric tests the right labyrinth gave no response after five minutes of aural stimulation. The left labyrinth gave a prompt and good response with nystagmus of large amplitude from the vertical and horizontal canals. There were slight pallor and questionable nausea.

The results of the Bárány tests, I regret to state, were misinterpreted, and the conclusions drawn were as follows:

"The results are not quite conclusive since the patient was very uncooperative and the tests could not be completely carried out. However, it is believed that a lesion of the cerebellopontile angle can be ruled out. The findings are more suggestive of a supratentorial lesion imposed on degenerative labyrinthitis, and in view of the presence of chronic suppurative otitis media an abscess of the brain or an epidural abscess with thrombosis of the lateral sinus should be considered."

Roentgenograms of the mastoid processes indicated chronic sclerosing mastoiditis, but no breakdown of bone. The right internal auditory meatus appeared slightly larger in caliber than the left, but no erosion was noted.

A ventriculogram indicated dilation of both lateral ventricles, including their temporal horns. Air was noted in the third ventricle, the aqueduct of Sylvius and the fourth ventricle. Although the entire third ventricle was not visualized, no tumor mass was outlined in this area. Midline structures were not shifted, and there was no evidence of a tumor of the fourth ventricle or the cerebellopontile angle.

It was decided in the neurosurgical conference to rule out an otogenic lesion, and the patient was referred to Dr. M. S. Ersner's service for exploratory mastoidectomy.

Mastoidectomy was performed on the right side, and a sclerosed mastoid process with a few areas of softening was found.

The lateral sinus and the dura in the posterior and middle fossae were exposed and appeared normal.

An aspirating needle was used in the cerebellar region which encountered an abnormal resistance but no pus.

The patient showed no improvement following the exploratory mastoidectomy, and Drs. Scott and Wycis explored the right cerebellopontile angle and removed a large acoustic neurinoma.

The patient, however, failed to show any improvement and died about six weeks later, of respiratory difficulty. Unfortunately, permission for an autopsy could not be obtained. It was suspected that the lesion of the cerebellopontile angle was one of multiple lesions, possibly metastatic.

Comment.—This interesting case has been instructive to me, for it has shown that:

1. Not all intracranial disease in the presence of disease of the middle ear is necessarily of otitic origin, though the logical procedure is to rule out otitic complications by exploratory mastoidectomy if neither the neurosurgical nor the neurotologic diagnosis is clearcut.

Fig. 11 (case 4).—Roentgenogram following ventriculography.

2. Evidence of a peripheral lesion on vestibular tests, even incomplete, that is, unilateral loss of vestibular function with partial loss of perceptive hearing in the presence of a central lesion, should lead one to suggest the possible presence of a lesion of the cerebellopontile angle even though one is unable to demonstrate the presence of it definitely. I have observed several cases of acoustic neurinoma not associated with disease of the middle ear in which there was presented only unilateral loss of function of the inner ear and another case in which there was only slight perceptive hearing impairment with loss of vestibular function.[6]

3. If the Bárány tests fail to give conclusive results either negating or confirming the diagnosis of vestibular or intracranial disease, t neurotologist should consult the other stud before rendering his opinion.

The confusing factors leading to the unavo ably incorrect interpretation in this case w the psychotic and uncooperative behavior of t patient, the inability to carry out the vestibul tests completely, the absence of spontane pathologic nystagmus except for the occasio inconstant rotatory first degree nystagmus the right, the partial loss of perception hear with sound lateralizing to the affected side the Weber test, the presence of the chro suppurative otitis media and perhaps a bit overconfidence assumed after the correct nearly correct interpretation of the first t cases presented—the one a case of trauma the head followed by infection of the middle with signs and symptoms of hematoma of t cerebellopontile angle and meningitis, and other a case of epidural abscess and thromb of the lateral sinus with cerebellar signs.

CONCLUSIONS

1. The Bárány tests represent a neurotolo examination of the vestibular mechanism, wh consists of the labyrinth (peripheral portio the vestibular nerve (the intermediate pathw which is partly peripheral and partly centra and the central connections (pons, medul cerebellum and cerebrum).

2. The Bárány tests are merely an adju to otologic, neurologic and neurosurgical di nosis. They are not infallible and by no me finally diagnostic; they have their limitati partly because of the lack of complete kno edge of the neuroanatomic pathways and pa because of an occasional error on the part of examiner in making his observations or in terpreting the results, particularly in confus and atypical cases.

3. When the results of the Bárány tests definitely positive or definitely negative, t are of great value and highly significant in ferentiating between a peripheral and a cent lesion and between an infratentorial and a sup tentorial lesion, as well as in establishing a di nosis of a lesion of the cerebellopontile an

4. A final otologic, neurologic and neu surgical diagnosis, however, should be m only after careful recording of the history, c plete physical examination, roentgen exam tion, and neurologic examination with study the eyegrounds, in addition to the Bárány te

5. One cannot condemn the Bárány tests cause they are not definitely diagnostic in ev case if one bears in mind the fact that a car

6. Neurologic and Neuro-surgical, Monday afternoon conferences, Temple University Medical School.

ysical examination without resort to the vari-
s laboratory facilities gives a correct diagnosis
only 50 per cent of medical cases. Atypical
d confusing neurologic and neurosurgical cases
nnot be definitely diagnosed unless all other
ailable studies have been made. Even a surgi-
l exploration occasionally fails to establish the
agnosis until the postoperative course has been
llowed for a reasonable period or until a care-
l postmortem examination has been made.

6. In some cases more than one lesion is
esent in the brain, and it is the lesion that causes
re destruction of vital structures which gives
e predominating findings or is instrumental
neutralizing, as it were, the signs of the other
sion. A similar situation can be brought about,
by a neoplasm in the posterior fossa or the
erebellopontile angle and by dilated third or lateral ventricles supratentorially as a result of increased intracranial pressure, which is really equivalent to a space-taking lesion.

7. The findings from Bárány tests in the presence of an intracranial lesion occurring with degenerative labyrinthitis or degenerative vestibular neuritis would be misleading since the peripheral station or the intermediate pathway would be blocked and a correct interpretation of the findings would be impossible.

8. The galvanic tests, though at best only qualitative, are of definite usefulness in neurotology in cases in which the Bárány tests cannot be used and in which it becomes necessary to differentiate between a labyrinthine and a retrolabyrinthine lesion when the Bárány tests fail to elicit vestibular responses.

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A TRANSPALATINE OPERATION FOR CONGENITAL ATRESIA OF THE CHOANAE IN THE SMALL CHILD OR THE INFANT

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Congenital atresia of the choanae is being more frequently recognized, and in time, with members of the medical profession more informed, it is likely that this condition will be discovered earlier and earlier in life. While operations for its relief have been increasingly successful in adults and older children, they have been less successful in small children and in infants. In an attempt to improve the results in these young patients, a transpalatine approach was tried with success in a 3 year old child. Because of the rarity of this congenital anomaly and the remote possibility of presenting a series of personal cases, this single case is reported. It is fully realized that the outcome in this particular instance may have been a fortunate one. However, it is hoped that this presentation may encourage other surgeons to test the merit of the operation.

TREATMENT

The usual textbooks offer little or nothing on the subject under discussion, and on turning to the periodical literature one is confused by the variety of corrective procedures presented. These operations, however, can be conveniently grouped as those in which the atretic wall has been removed by the following approaches:

1. Surgical removal of the obstruction by direct approach through the nares. One or more instruments, such as trocars, burrs, chisels, drills, trephines, punches and curets, have been used on the obstructing wall. The removal of the posterior end of the vomer has been an important additional procedure in the opinion of many surgeons. Rubber tubes, bougies, packing, metal splints and skin grafts have also been used to keep the passage open. These methods have been used with some success in the treatment of patients of all ages.

2. Cautery removal by direct approach through the nares. This approach could be considered under the heading of direct surgical removal, but it has been mentioned separately because of its very different method and because it has usually been employed in adults. At times it has been used secondary to direct surgical removal. It includes use of chemicals, galvanocautery and surgical diathermy.

3. Removal after primary submucous resection of the nasal septum. The posterior end of the entire septum has been removed by some operators, and others have made an opening through the posterior portion of the septum—with or without removal of the occluding diaphragm in patients with unilateral occlusion. These approaches have been successfully applied in adults and older children.

4. Removal by an oral approach through the palate. This will be discussed later.

REPORT OF A CASE

J. C., a girl 3 years of age, was seen at my office on April 20, 1943. She complained that the left side of her nose stopped up easily, that she could not blow through it and that clear mucus ran out, particularly when she leaned over. This nasal disorder had been present since birth, but medical attention had not been sought as the parents thought the condition would disappear spontaneously. The child's general health had been good.

Examination revealed a generally well developed and nourished child. Special examination, however, showed the left nostril and floor of the nose to be somewhat higher than the right. The septum was deviated slightly to the left. The right nostril was dry, whereas the left contained a large amount of whitish mucus. This was removed by suction, and a smear of this secretion revealed many polymorphonuclear neutrophilic leukocytes. The patient could blow normally through the right nostril, but no air came through the left side. Nor could air be blown through the left side of the nose into the nasopharynx. Also, a probe could be passed easily through the right side of the nose into the nasopharynx, whereas on the left side the probe met resistance of a hard type about ½ inch (12 mm.) proximal to the posterior pharyngeal wall. Digital palpation of the posterior nares by way of the nasopharynx revealed a complete firm obstruction of the left choana. Colored solution instilled into the left nostril failed to appear in the pharynx, thus further demonstrating the completeness of the obstruction.

A diagnosis of congenital bony atresia of the left choana was made. In order to locate with great accuracy the position of the wall, a radiopaque oil was

Read at the annual meeting of the Western Section of the American Laryngological, Rhinological and Otological Society in Los Angeles on Jan. 22, 1944.

stilled into the left nostril with the patient in the dorsal ecumbent position, and roentgenograms were taken. These showed complete obstruction at the level of the hoana (fig. 1).

Operation was advised, but I felt a certain dissatisfac-ion with the various procedures which had been advo-ated. Complete removal of a bony wall at the pos-erior end of the nose through the small nostril of a oung child seemed difficult and awkward, and frequent ailures of such operations were recalled. It was felt hat there must be some other way to approach this roblem successfully. The thought occurred that the tretic wall might be attacked more or less directly

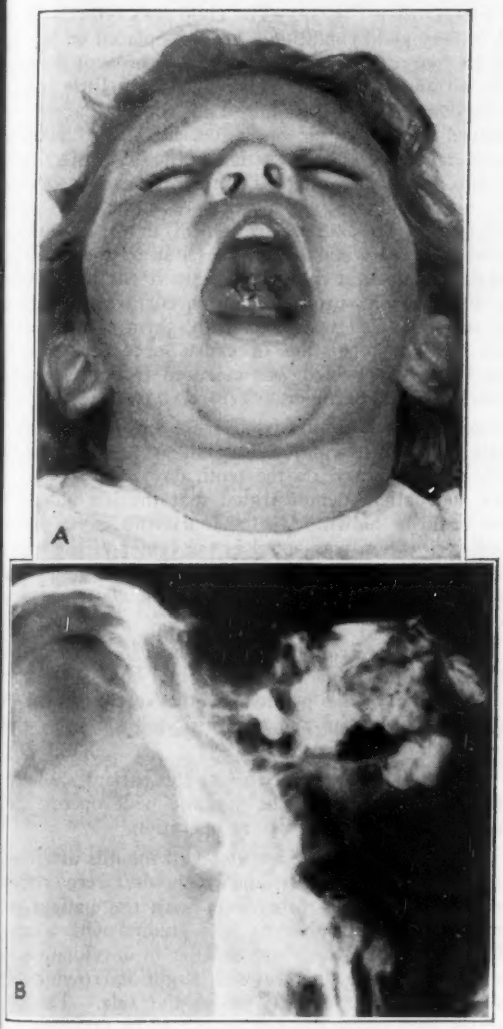


Fig. 1.—*A*, the patient, a girl aged 3 years. The stril and the nasal floor on the left side are higher. he palate is shown as it appeared on the tenth post-erative day, just prior to removal of the sutures. *B*, lateral roentgenogram of the head ten minutes after dized poppyseed oil 40 per cent had been instilled in the t nostril with the patient in the dorsal recumbent sition. The radiopaque oil lies against the choanal ate; none enters the nasopharynx.

ough an opening between the hard and soft palates. is appeared all the more feasible because of a famili-ty with the comparative ease of surgical operation r cleft palate. The details of such an operation were nned and carried out.

Operation.—On June 15, 1943, the child was anesthetized with solution of tribromoethanol and ether vapor for operation. The operating table was tipped so that the head was lower than the foot. The child's head and neck extended beyond the end of the table, resting in the lap of the surgeon, who sat facing the head of the table just as for the operation to correct a cleft palate. A Davis gag was inserted to keep the mouth open and the tongue out of the way. The posterior edge of the hard palate was located with a probe, and an outline of the palate was marked in several places by dipping the tip of a curved tonsil-injecting needle in aqueous methylene blue and pushing the needle through the soft tissue at the margin of the hard palate.

If one studies a dry skull, one can visualize the course taken by the posterior palatine vessels and nerves after they emerge from their foramens, diagonally forward to their passage into the anterior palatine foramens. The proposed incision was designed to avoid injuring them. Also, since it has been shown that removal of the posterior end of the septum tends to prevent recurrence of the obstructing wall, it seemed that this prevention could be further enhanced by removing the base of the occluding wall, which was the adjacent hard palate. It was therefore desirable that the incision permit adequate approach to this structure. A forward-curved incision appeared to meet these requirements. Moreover, it was

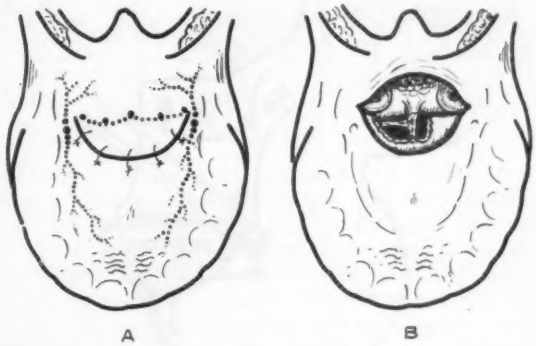


Fig. 2.—In *A* the position of the palatine vessels and nerves to be avoided is indicated. The posterior margin of the hard palate has been roughly outlined by a few puncture marks made with a needle dipped in aqueous methylene blue. The incision and the approximate position of the sutures are shown. In *B* the posterior portion of the hard palate and the septum have been removed, as well as the entire atretic wall. Bilateral obstructions can be easily removed through the incision for removal of a unilateral obstruction.

felt that the bottom of the curve should come far enough forward so that when the incision was sutured later it would have bone for a floor instead of the cavity of the posterior nares. This would provide less chance for the development of a perforation in case of postoperative infection (fig. 2).

The incision was made with a no. 15 Bard-Parker knife blade. The soft tissues posterior to the incision were dissected free from the hard palate to its posterior edge. Then, with an angulated elevator, the soft tissues were freed from the margin of the hard palate and for a short distance forward on its nasal surface. This was then severed with the knife. The soft palate immediately retracted posteriorly quite a distance without the aid of artificial retraction. Pushing back the soft palate with a small suction tip, one could easily see the slanting backward edge of the septum and the adenoids and look directly into the cuplike pits of the orifices of the

eustachian tubes. This was such an unusual view of these structures that it was surprisingly strange for a few moments. A small nasopharyngeal mirror dipped in hot water and quickly wiped dry by the nurse was frequently used during the subsequent part of the operation. The right posterior naris appeared normal, while the left was closed completely by a concave white wall of bone covered by mucosa.

A narrow strip of bone was removed with a small Citelli punch forceps from the hard palate adjacent to the septum on the unaffected right side. Then, with mallet and chisel, a similar slit was made through the left side of the hard palate adjacent to the septum. Proceeding laterally with the chisel, the hard palate was pierced anterior to the obstructing bony wall. The bone of the palate was reasonably thin at this location. Pieces of bone were removed in this area with chisel and bone forceps, and then the atretic wall was easily removed under direct vision. The wall was about ⅛ inch (3 mm.) thick at its widest portion, which was near the hard palate. Next, bone of the septum was removed posteriorly with biting forceps (fig. 3). Then, a small suction tip was passed through the nose into the posterior nares to remove the blood. By using a mirror,

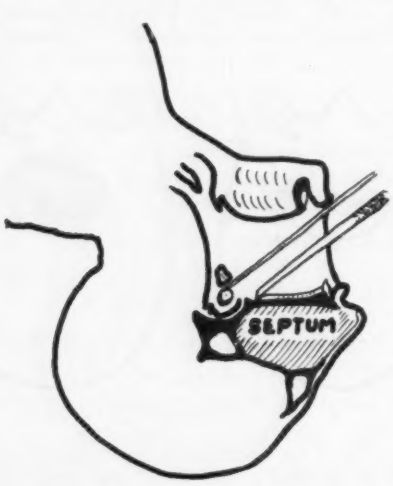


Fig. 3.—Sagittal section of the head in the position maintained during the operation. The mouth gag has been omitted to clarify the illustration. Note the choanal plane in line with vision and the operative procedure. This adds considerably to facility of operation.

small remnants of the obstructing wall were well observed. A small angular biting forceps was substituted for the suction tip in the nose, and with the aid of a mirror the bony and mucosal remnants were completely removed. This cleaning of the operated area could have been accomplished more directly if a greater amount of the palatine bone had been removed. This, however, was not desirable, and furthermore the cleaning was easy enough to perform in the manner mentioned. The posterior parts of the nasal fossae were then studied. The right side had fairly large, normal-appearing middle and inferior turbinate tips, but those on the left were extremely small. This variation has been noted in other cases reported in the literature. The size of the left posterior naris was by development somewhat smaller than the normal right one.

Finally, the incision was closed with five or six sutures, medium fine silks being used. Fine dermal sutures would perhaps have been preferable. Each suture was placed well back from the edge and through the full thickness of the soft tissues. None was tied until all were in place. Then, starting with the most lateral suture on each side and proceeding toward the midline, the sutures were tied. This facilitated closure of the central sutures with the minimum of tension. A small rubber balloon attached to a no. 10 French rubber catheter was placed in the nose to apply moderate pressure to the operated area in the posterior naris. The catheter was pulled through the nose from behind until the balloon fit rather snugly into the posterior naris. The balloon was prevented from slipping posteriorly by passing the free end of the catheter through a one-half inch button and fixing it to this under slight tension so that the button rested against the nostril.

Postoperative Course.—The child was returned to her bed in very good condition. She was placed on her side and the foot of the bed was elevated to prevent aspiration of blood and secretions. There had been little bleeding throughout the operation. The rubber balloon was removed the day after operation, for it had interfered considerably with the ingestion of fluids, projecting too far into the nasopharynx. The temperature was elevated this first day but was normal or practically normal thereafter. The administration of moderate doses of sulfadiazine was started on the first postoperative day and discontinued at the end of the sixth day. Also, during this time a suspension of paredrine hydrobromide and sulfathiazole [1] was used in the form of drops in the nose. Slight formation of crusts occurred about the nose anteriorly, which was cleansed from time to time with hydrogen peroxide.

The patient was dismissed from the hospital on the sixth postoperative day. The sutures, which had healed well, were removed on the tenth day. Before this was done the patient demonstrated that the left side of the nose could be blown. On the fourteenth day a pinhead sized perforation was noted in the center of the incision and when the patient took liquid some of it came through the nose. The perforation closed, however, in a few days.

Microscopic Examination of the Bone Removed.—The atretic structure showed normal compact and cancellous bone. One portion was covered by stratified columnar epithelium and contained some mucous glands of normal appearance.

On her occasional office visits the patient showed the left side of the nose to be dry and wide open. Speech was good, the same as before operation.

On Dec. 3, 1943, five and one-half months after operation, the child's tonsils and adenoids, were removed. Preliminary to this procedure, with the patient under anesthesia the nasopharynx was studied with a mirror. The left choana, which was smaller in development than the normal right one, showed slight narrowing above and laterally, but not on the medial side. The rather narrow web above did not appear to be attached to the dwarfed middle turbinate tip. Rather, it seemed to be the natural result of scar formation opposite the periphery of the once obstructing wall. The opening now measured about 8 mm. in width and about 10 mm. in height. With a mirror as a guide, a delicate sphenoid punch was inserted through the nose, and part of the superior web was punched away. However, it was found that because of the natural narrowness in this area a small web would form here regardless of the completeness of operation. Possibly a thin split skin graft fitted over a finger-like rubber balloon and pulled into the choana from behind might give a still larger opening than the one obtained; but this is doubtful. Nevertheless

1. Paredrine hydrobromide is parahydroxy-α-methylphenylethylamine hydrobromide.

ss, the fact remained that the choana was adequate function. The patient could breathe and blow her se vigorously on the affected side, and the nose was y. A probe passed along the floor of the nose showed at there was no noticeable step up into the nasopharynx.

(NOTE.—On Sept. 11, 1944, one year and three months er the operation, a letter was received from the child's ther. This stated that the child's nasal breathing d the quality of her voice were excellent and that she d had only one cold. There were times, however, en the left nostril showed some drainage of clear cus. This was noted particularly in windy weather.)

A REVIEW OF TRANSPALATINE OPERATIONS REPORTED IN THE LITERATURE

If the literature had been thoroughly investiged before I proceeded with the operation just orted, it would have been discovered that ere were several references to an oral translatine approach for the correction of choanal resia. All but one of these reports were made foreign authors. Brunk [2] in 1909, wishing use a cutting instrument to remove the posior end of the septum, did not see how this s possible under vision if the operation was formed through the nose. He thus chose a latine approach. His patient was a young man of 20 years with a complete osseous clusion on the left side. A solution of procaine drochloride was injected into the floor of the se, the septum and the hard and the soft palate. longitudinal incision was made in the midline the hard palate, extending posteriorly through mucosa of the soft palate for 1.5 cm. The riosteum was elevated on the left side, and posterior margin of the hard palate was seled away. The bone was extremely thick, d it was removed with great difficulty. It was long after operation that the choana again sed. Reoperation was not performed. Brunk that any type of surgical treatment would e failed in his case because of the extreme ckness of bone. He suggested that transmination be used as suggested by Kahler, reby one could estimate before operation the sity of the bony wall.

Blair [3] in 1931, reporting on various types of al atresia, mentioned a case of bilateral membnous atresia of the posterior nares in an int. He stated that the normal approach for rection of the obstruction here would seem e that of splitting the mucoperiosteum of the te and the velum. After dividing, elevating retracting each half of the mucoperiosteum of the underlying palatal process, the major part of the bony palate is removed, as well as that of the cartilage and bone of the nasal septum. A mass of fibrous connective tissue which lay between the posterior ends of the nasal fossae and the nasopharynx was removed (fig. 4 *A*). The two mucoperiosteal surfaces of the floor of the nose were incised lengthwise, and the medial edges were sutured together over the stump of the nasal septum. The nasopharyngeal mucosa lining the posterior surface of the structure causing atresia was converted into a tongue-

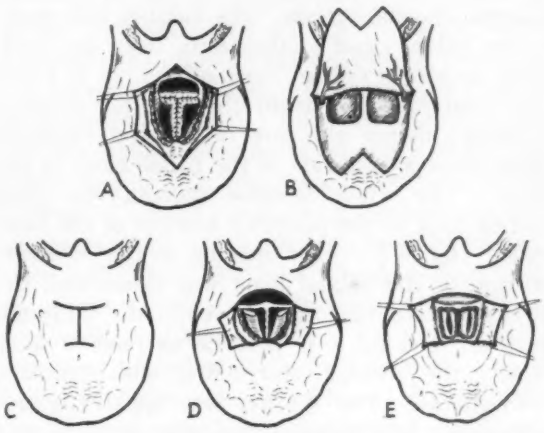


Fig. 4.—*A*, transpalatine operation after Blair.[18] The incision is longitudinal and in the midline, extending from well forward on the hard palate back into the soft palate. The major portion of the hard palate has been removed, as well as that of the bony and cartilaginous septum. The choanal obstruction has been removed. The mucoperiosteum of the nasal floor has been incised lengthwise, and the medial edges have been trimmed and sutured together to cover the rough edge of the roof of the septum. The mucosa covering the posterior surface of the atretic wall is made into a tongue flap, base up, and sutured so as to cover the rough edges of the lateral and upper margins of the remnants of the atretic wall.

B, transpalatine operation after Steinzeug.[4] Awerbuch's incision for removal of the sphenopalatine ganglion is used. Openings are then made through the posterior portion of the hard palate and the mucosa of the nasal floor on each side of the septum, the latter not being removed. Through these openings the choanal plates are removed.

C, incisions after Schweckendiek.[5] *D*, transpalatine operation after Schweckendiek. The posterior part of the bony portion of the hard palate has been removed. The mucosa of the nasal floor has been preserved and elevated from the sides of the septum and the anterior wall of the atretic bone.

E, transpalatine operation after Neto.[6] Schweckendiek's incision is used with some modification. The posterior transverse incision is ordinarily carried only through the palatal mucosa of the soft palate, and the posterior bony rim of the hard palate is not removed. The posterior portion of the bony septum is removed, as are the atretic walls. The mucosa of the nasal floor is incised as shown only if satisfactory choanal openings are not obtained with the foregoing procedure.

2 Brunk, A.: A New Case of Unilateral Osseous anal Occlusion: An Operation Through the Palate, hr. f. Ohrenh. **59**:221, 1909.

3 Blair, V. P.: Congenital Atresia or Obstruction ir Passages, Ann. Otol., Rhin. & Laryng. **40**:1021,

shaped flap, base up, and sutured anteriorly and laterally to cover the raw surfaces. Thus, a continuous passage into the nasopharynx was obtained, lined with mucosa on its upper and lateral surfaces. The operation was completed by suturing the mucoperiosteum in the midline. No end result was mentioned.

Steinzeug [4] in 1933 was of the opinion that operative procedure in any case of choanal obstruction is difficult, and that a satisfactory result is seldom obtained. Therefore, he decided to apply Awerbuch's approach for the removal of the sphenopalatine ganglion in operating on bilateral choanal atresia. An incision was made in the palate close to the teeth, from the back tooth forward to about the midline. A V notch was then made to avoid the anterior palatine foramen; thence the line of incision returned along the opposite side of the palate close to the teeth. The whole palatine mucosa was then turned back to the posterior margin of the hard palate (fig. 4 *B*). An opening in the posterior portion of the palatal bone was made, and the adjacent nasal mucosa was removed. Through such an opening it is possible to remove completely the choanal obstruction with ordinary instruments. The septum was apparently not removed. The palatine flap was replaced and sutured. Steinzeug suggested preparing a celluloid plate and attaching it to the teeth in order to support the palate. With this support provided, nourishment can be taken immediately after operation. He expressed the belief that the operation can easily be performed by the otolaryngologist, and he intended it for use with patients of all ages.

Schweckendiek [5] in 1937 reported 2 cases in which a newborn infant was operated on by a transpalatine approach. In each case the osseous occlusion was bilateral. The operation was performed on the nineteenth and the tenth day after birth, respectively. With the patient under local anesthesia and sedation induced with phenobarbital sodium, an incision was made to separate the hard and soft palates. It was kept at a sufficient distance from the palatine vessels and nerves. Next, a midline T incision was made to join the first incision (fig. 4 *C*). The T incision was 2 cm. long. Mucoperiosteal flaps were dissected up laterally to expose the hard palate (fig. 4 *D*). The choanal atresia was visible through the posterior part of the opening. The palatine bone was chiseled through close to t midline, and the mucoperiosteum of the na floor exposed. This was elevated to the e of the vomer, and the latter was removed. T mucosa of the nasal floor was incised, and t bony atretic walls were removed with bo forceps. Thus the posterior nasal space w considerably widened. The palatine flaps we sutured in the first case, and the patient did w after operation, with little elevation of tempe ture and no appreciable evidence of shock. Ho ever, on the fifth postoperative day, the sutur gave way, and a fairly large triangular openi resulted. Schweckendiek felt that this was fortunate happening, however, for it permit him to observe the postoperative changes. T weeks after operation a new fibrous wall star to form. The opening in the palate began close in three to four weeks, and this and choanal openings had to be kept patent by passage of catheters. Diathermy and fine cur were used to remove the newly formed tiss He explained that bougienage should be d with great care, as it is apt to produce sh that persists for some time. Here, bougies w used only once in two weeks, and later a cou of times at three to four week intervals. T procedure was then stopped, as the remain opening was satisfactory. The palatal open closed fairly rapidly.

In his second case, the palatal flaps were sutured in order that a palatal opening mi exist from the start. It had also been obser in the first case that the baby breathed and much better after the palate had opened There was less tendency to stenosis in the sec case. Noisy breathing appeared about ev three weeks, indicating fibrous contract Bougies were used in this case as well, to k the nasal and the palatal opening patent, latter being difficult to maintain.

Schweckendiek also described a transpala operation for unilateral atresia in older pati in case one preferred this approach to an in nasal one or a combination.

Neto [6] in 1942 reported 2 cases of bilat atresia in which a transpalatine route had b used. One of the patients was a female c 2 days old, and the other was an 8 year old Local anesthesia was used alone in the for and was combined with sedation induced b barbital derivative in the older child. technic used is similar to that described

4. Steinzeug, A.: Surgical Technic for Removal of Choanal Coalescences, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **137**:364, 1933.

5. Schweckendiek, H.: Transpalatinal Therapy of Congenital Choanal Atresia, Ztschr. f. Hals-, Nasen- u. Ohrenh. **42**:367, 1937.

6. Neto, J. R.: Transpalatine Route in Therap Bilateral Congenital Imperforation of Choanae, Report of Cases, Rev. brasil. de oto-rino-laring. **10** 1942.

hweckendiek. However, the posterior incion is 2 mm. behind the posterior edge of the rd palate and is made only through the mucosa the soft palate. Moreover, the bony window ade in the hard palate on each side of the nasal ptum does not include the posterior bony marn of the hard palate. The mucosa of the nasal or is elevated, also that of the septum. Then, e posterior portion of the septum is removed th forceps. This permits a good view of the etic walls, and these are removed with chisel d forceps (fig. 4 *E*). A rubber tube is now roduced through the nose, and if this passes ily into the nasopharynx no further surgical noval is necessary. However, if the tube ets with obstruction, the mucosa of the floor the nose is incised longitudinally to permit dy of the cause of the obstruction to the tube. necessary, the first transverse incision is card through the remaining thickness of the soft ate. When the obstruction has finally been moved, tubes are placed through the nose into pharynx to the level of the uvula. The ximal ends are fixed together in front of the se. The incisions are closed with no. 0000 romic gut on an atraumatic needle. The author essed the ease of operation. The postoperae care resembles that following any other ilar operation. The nasal tubes are removed ween the eighth and the tenth days. In each e the outcome was successful.

Two other references were given by Neto, but y related to abstracts of papers that had apparly been read at meetings and had not been y published. The information contained in abstracts is meager. One of these authors, rniček,[7] in 1937 presented an 8 year old child whom a transpalatine operation had been cessfully performed according to the method d in 3 cases reported by Precechtel[8] in 1938. information is given as to the latter's technic. wever, he stated that it was not to be emyed in young infants. Rather, he preferred these a simple perforation to create a temary passage, which should be corrected later a more radical procedure. Hlavacek, in dising Horniček's paper, stated that since Pretel's work was reported, in 1938, all patients h choanal atresia appearing at the Otolaryngic Clinic of Prague, Czechoslovakia, had n operated on by a transpalatine route with ellent results.

7. Horniček: Operation of Osseous Choanal Atresia the Transpalatine Route, Acta oto-laryng. **25**:193, 7.

8. Precechtel, A.: Transpalatine Operation of anal Atresia, Ann. d'oto-laryng., 1938, p. 1014.

COMMENT

It is obvious from this review of the reported cases of transpalatine operations that such an approach is well tolerated by newborn and young infants. The only criticism of all these operations is that there is perhaps too much surgical work connected with most of them. The dissection of soft tissue and removal of bony tissue are too extensive. Blair's manipulation of the various nasal mucosal flaps is ingenious and may be necessary to insure good results. However, the necessity for removing so much of the palate and the septum is questionable. Will such removal interfere importantly with future normal development? Steinzeug's dissection of the entire mucous membrane of the hard palate seems unnecessarily radical. Schweckendiek's operation also appears to remove too much of the hard palate and necessitates wide incisions and dissection. Perhaps the stenotic tendency in both of his patients was greatly favored by the upward collapse of the poorly supported palatine tissues after such extensive removal of the supporting bone. Neto improved the technic of the operation described by Schweckendiek. There is less extensive removal of bone, and the aftercare is greatly simplified. Compared with Neto's procedure, the technic employed in the case reported in this communication is somewhat simpler. If one includes in it the removal of the bony floor of the palate opposite the occluding wall, it should tend further to prevent the reformation of a cicatricial membrane. The wearing of nasal tubes and a more extensive exposure may be found necessary in the newborn infant, but this has yet to be tried. There is objection to leaving tubes in the patient's nose for many days. These are foreign bodies, and the secondary infection which they aggravate tends to increase the formation of scar tissue. Furthermore, such increased infection may lead to secondary infection of the lower respiratory tract, which is to be avoided if possible.

SUMMARY

The present day treatment of congenital atresia of the choanae in the adult and the older child is successful. Operation by way of a submucous resection with removal of the obstructing wall and the posterior end of the vomer as proposed by von Eicken[9] in 1911 and in this country by White[10] in 1918 has given better results than

9. von Eicken: Treatment of Choanal Atresia, Verhandl. d. Ver. deutsch. Laryng., 1911, p. 593-600.

10. White, L. E.: Operation for Bony Occlusion of Posterior Nares, Laryngscope **28**:571, 1918.

the preceding Uffenorde [11] operation. Kazanjian's [12] recent method of displacement of the midnasal tissues for better removal of the posterior part of the septum and the atretic structure also seems to be a good procedure. These operations, however, are hardly applicable to the young child or the infant because of the very small size of the nares. Even if their application were possible, it is questionable whether the septum should be removed to the extent demanded by them. Some laryngologists [13] may prefer diathermic electrocoagulation for adults as an office procedure or as a procedure secondary to surgical destruction of the choanal plate. Bonham [14] has used the latter method to advantage in older children who were under intravenous anesthesia.

A direct surgical approach through the nasal fossa in the small child or the infant has long been used, but with many failures. The successful results have often been obtained only by means of considerable after-care, which has been a strain on both the physician and the patient. That such varying results should occur is understandable, for operations with this approach are more or less blind and clumsy procedures. There can be no doubt that in addition to the frequent incompleteness of operation, trauma to adjacent tissues contributes to the reformation of a fibrous obstruction. Of these procedures, the one most apt to be successful would seem to be one in which skin grafts are used,[15] perhaps preferably split skin grafts.

In the newborn infant with complete bilateral choanal occlusion, the usual attendant difficulty in breathing leads to asphyxia and may res in death. Ronaldson's [16] original description this condition is most interesting. Its cy character has been stressed by Richardson [17] a others. Immediate relief can be obtained by p viding an adequate oral airway. The ton should be pulled forward and away from roof of the mouth and the posterior pharyng wall to provide this airway. Then, a breath tube similar to but longer than that used Blair [18] in his operations for cleft lip or a cur obturator like that used by New [19] can be serted into the mouth and pharynx until s time as the infant develops the habit of mo breathing or until the nasal obstruction can safely removed by operation. Some operat may prefer immediate simple perforation dilatation of the membranous atretic structu with the patient under local anesthesia. For osseous occlusions in particular, a transpala approach is suggested.

As all members of the medical profes become better informed in regard to this ra rare congenital abnormality, its presence in small child and the infant will be more freque diagnosed. In an attempt to obtain more as ance of a successful result in these patients transpalatine operation was planned and performed in a single case, presented in article. The successful result in this case comparison of the operation with other tra palatine operations indicate that the tech described has merit. It requires further trial.

3661 East Lincoln Avenue.

11. Uffenorde, W.: Case of Choanal Atresia, Ztschr. f. Laryng., Rhin. **1**:475, 1908.

12. Kazanjian, V. H.: Treatment of Congenital Atresia of Choanae, Ann. Otol., Rhin. & Laryng. **51**: 704, 1942.

13. Morgenstern, D. J.: Congenital Atresia of Postnasal Orifices: Simple Effective Office Technic for Treatment by Electrocoagulation, Arch. Otolaryng. **31**: 653 (April) 1940.

14. Bonham, W. L.: Congenital Choanal Occlusion, South. M. J. **35**:252, 1942.

15. Donnelly, J. C.: New Method of Operation for Congenital Atresia of Posterior Nares, Arch. Otolaryng. **28**:112 (July) 1938.

16. Ronaldson, T. R.: Note on Case of Congen Closure of Posterior Nares, Edinburgh M. J. **26**:1 1881.

17. Richardson, C. W.: Congenital Occlusion of P Nasal Orifices with Report of Case, Tr. Am. Lar A., 1913, p. 226.

18. Blair, V. P.: Surgery and Diseases of the M and Jaws, ed. 3, St. Louis, C. V. Mosby Company, p. 240.

19. New, G. B., in discussion on Anderson, C. Congenital Occlusion of the Choana. J. A. M. A. 1788 (Nov. 27) 193[illegible].

ANESTHESIA FOR TONSILLECTOMY INDUCED BY INTRAVENOUS ADMINISTRATION OF PENTOTHAL SODIUM

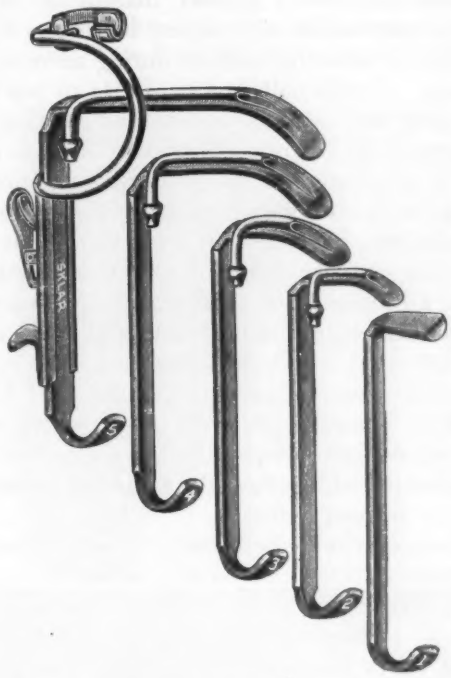
SAMUEL L. FOX, M.D., AND SAMUEL ROCHBERG, M.D.
BALTIMORE

One of us (S. L. F.) first used pentothal odium intravenously to induce general anes- esia for tonsillectomy in December 1942. Prior this time he had used intravenously induced esthesia successfully in reducing fractured ses, in mastoidectomy, in plastic procedures out the nose and ear and in intranasal opera- ns on sinuses.

However, the consensus among anesthetists d surgeons was that intravenously induced esthesia was not feasible in operations on the oat. Yet it was felt that the drug would be ideal anesthetic in adults if its administration uld be arranged satisfactorily. One of the ajor objections to the use of intravenous anes- sia was the frequent complication of laryngeal asm. This was overcome by preventing secre- ns of the mouth and the throat from coming contact with the larynx by placing the patient the table in the head-low (Trendelenburg) sition and frequently using throat suction. nother objection to the use of the drug was the t that deep anesthesia is required to abolish pharyngeal reflex, which might result in oxia. This can be obviated by continuous in- flation of oxygen by way of the mouth gag. spite of these difficulties, which can be over- me, it seemed that the major cause of previous ilure had been the lack of an adequate airway roughout the operation. In order to maintain ch an airway, the Davis mouth gag was em- oyed exclusively. This gag is so constructed t the tongue is held downward and forward, mouth is kept open, and oxygen, ether or rous oxide can be supplied at the same time. e Davis gag is supplied with detachable tongue des of various sizes. If the proper size blade employed, the tip of the blade will fit into the poepiglottic sulcus and the tongue will be suffi- ntly depressed to insure an adequate oro- aryngeal airway. The epiglottis is frequently sible if the blade is inserted correctly (figure). To date, adenotonsillectomy has been per- med on approximately 200 patients who were der pentothal sodium anesthesia. Laryngeal asm has occurred in only a few, and in these spasm was overcome by temporarily stopping the operation, suctioning all blood and secretions from the throat and administering more of the anesthetic. With all patients the following routine has been observed:

1. Only adults have been given pentothal sodium. The youngest patient was 13 years old but quite large of build.

2. All patients have been given from ¼ to ⅓ grain (16 to 22 mg.) of pantopon (a mixture of the hydrochlorides of the opium alkaloids) and $\frac{1}{150}$ grain (0.43 mg.) of atropine sulfate hypodermically from one-half to one hour preoperatively.



The Davis mouth gag with its supply of detachable tongue blades of various sizes.

3. All patients are placed in the head-low (Trendelenburg) position with a sandbag under the knees. The patient is draped, and the surgeon and his assistant are in their operating positions before the administration of the pentothal sodium.

4. In addition, the throat suction apparatus is connected before the anesthetic is administered, so that the assistant is ready at all times to aspirate any secretions or blood from the throat.

5. As soon as the patient is profoundly asleep, the Davis mouth gag is inserted. The operation is not begun until the throat muscles are quiet and the phar-

yngeal reflex is abolished; otherwise, the stimulation produced may make it difficult to maintain smooth anesthesia.

6. The drug is administered as needed to keep the patient asleep throughout the operation.

7. The assistant must keep all secretions away from the hypopharynx and the larynx by frequent use of the throat suction apparatus.

8. All bleeding must be completely controlled before the patient leaves the operating table, to obviate the danger of subsequent aspiration.

9. A breathing tube is placed in the mouth at the end of the operation to maintain an adequate airway until the pharyngeal reflex returns.

10. When the patient is returned to his bed, he is placed in a semilateral position with a pillow beneath the chest, and the head is extended. This position permits drainage of blood and secretions from the mouth and allows the tongue to fall forward, thus preventing obstruction to the airway.

In our experience slightly less of the drug is necessary if a 2.5 per cent rather than a 5 per cent solution is used. Furthermore, the weaker solution provides a greater margin of safety. The average adult will require between 1.0 and 1.5 Gm. of pentothal sodium during adenotonsillectomy. Occasionally less than 1.0 Gm. has been adequate, and at times as much as 2.0 Gm. has been required. If nitrous oxide, as well as oxygen, is administered throughout the operation by way of the mouth gag, the total dose of pentothal sodium will be materially reduced. This has been the practice followed in the more recent cases, a mixture of approximately equal parts of oxygen and nitrous oxide being used. The average induction time is less than one minute, and the total operating time is usually from fifteen to thirty minutes. In every case the operation was successfully completed while the patient was anesthetized with pentothal sodium, supplemented only by nitrous oxide.

Postoperatively there may be some headache for about six hours, but in no case has any vomiting occurred during the period of reaction. The average patient reacts and becomes rational in about thirty minutes, but, if not aroused, practically every one will sleep naturally for the next four to six hours. The patient may be awakened more quickly by administering 1 ampule (7½ grains [0.48 gm.]) of caffeine and sodium benzoate hypodermically on completion of the opera tion. It is routine to examine the patient's thro within an hour after the operation. Water given to the patient as soon as requested pos operatively, and the next meal may be taken the patient desires it. Practically every patie has been operated on in the early afternoon an has been discharged from the hospital the ne morning. Although morphine has been ordere as circumstances may require postoperatively every case, in only an occasional instance do the patient require this postoperative medicatio patients operated on under nitrous oxide–eth anesthesia almost always require morphine pos operatively, at least during the period of reactio

The authors feel that pentothal sodium offe definite advantages over nitrous oxide–eth anesthesia in adults. There is practically induction time; the drug may be used in patie with complicating disease of the upper respirato tract or the lungs; the reaction is quiet and u accompanied by vomiting, retching or restles ness, and the anesthesia is followed by a peri of quietude. Fluids may be taken orally almo immediately after the operation and consequent dehydration and fever do not occur even in wa weather; postoperative sedation is almost ne necessary. In every case in which pentoth sodium has been administered and another oper tion has been necessary at a later date, the patie has invariably requested that pentothal sodiu be used again. Obviously, the margin of saf between the effective dose and the minimum leth dose is narrower with pentothal sodium than wi ether, but in our experience there has seemed be no undue danger when the drug is admini tered by a competent anesthetist who is famili with the method of administration outlined this article. It is also recognized that pentoth sodium produces slight vasodilatation, and th combined with the head-low position, occasiona results in some capillary oozing. Careful diss tion and tying of vessels at the time of the oper tion will control this.

NOTE.—To date almost 300 patients have been opera on under anesthesia induced with pentothal sodium.

1205 St. Paul Street.

Case Reports

AN UNUSUAL FOREIGN BODY OF THE NOSE

MAJOR VIRGIL S. STEELE, MEDICAL CORPS, ARMY OF THE UNITED STATES
AND
MAJOR EDMUND C. DOW, DENTAL CORPS, ARMY OF THE UNITED STATES

This case is being reported because it resents a most unusual finding and illustrates e necessary cooperation between the dentist nd the otorhinolaryngologist.

On routine physical examination a healthy 25 year d Negro soldier was found to have a tumor in the

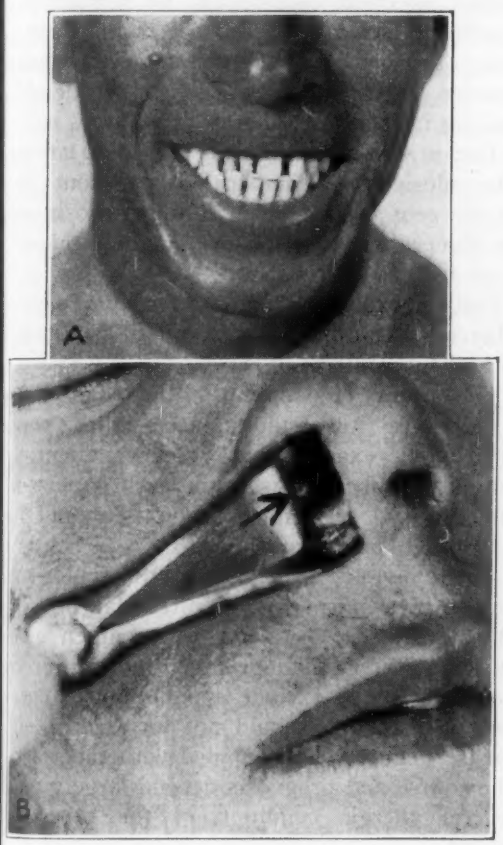


Fig. 1.—*A*, patient's teeth in occlusion. *B*, nasal exure showing a tooth in the floor of the nose.

ht nostril. He denied having any nasal symptoms m or in the past. Rhinoscopic examination showed nose to be normal except for a bony growth on floor of the right nostril just anterior and medial the anterior tip of the inferior turbinate.

The bony tumor, being denuded of mucous membrane top, was about the size of, and gave the appearance an incompletely erupted tooth; a gum line extended the tooth near the crown. The tooth was movable erally and medially, but was fixed in the anteriorterior plane, and apparently projected anteriorly and eriorly.

Dental examination showed a full set of upper teeth h a narrow right central incisor which allowed spaces to appear between other anterior teeth; roentgenograms showing the full mouth and sinus showed a supernumerary tooth in the right nasal passage.

With the field under local anesthesia, the fibromucosal (gum) tissue around the tumor was dissected away by knife and submucous elevator, and the tumor was removed with a curved hemostat; the wound was dusted with sulfanilamide powder and a petrolatum gauze pack inserted. The wound healed nicely.

The report from the pathologist was: "The gross specimen has the appearance of a poorly formed tooth measuring 12 by 7 by 6 mm. It has a curved conical shape with a structure suggesting a small incisor. The microscopic section consists of several fragments of tissue covered by stratified squamous epithelium, which is moderately hyperplastic and in part appears to be partially keratinized. There is a diffuse infiltration of chronic inflammatory cells in the submucosa. In the deep portion of the fragments there is a flattened layer

Fig. 2.—*A*, roentgenogram showing the position of the tooth. *B*, removed tooth.

of stratified squamous epithelium. Small fragments of calcified material are adherent to one of the fragments. Diagnosis: dentigerous cyst containing a tooth."

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

SURVEY OF THE LITERATURE ON TUBERCULOSIS—1940-1943

GEORGE E. WILSON, M.D.
ASSISTED BY WILLIAM K. STERN, M.D.
SARANAC LAKE, N. Y.

(Concluded from page 371)

LARYNGEAL TUBERCULOSIS

Acevedo Sojo's [64] paper represents a series of lectures giving an extensive and elaborate review of laryngeal tuberculosis with numerous bibliographic references, clinical classifications and statistical extractions. It is a scholarly and thorough article, illustrated by excellent laryngeal photographs. Published in 1940, it does not give any progress in the field of otolaryngologic tuberculosis which has any bearing on the period covered by the present summary. The contents may be outlined:

1. Historical review: Laryngeal tuberculosis is no local illness of an isolated organ but is usually associated with systemic tuberculosis. For this reason the author suggests a more exact term, "laryngopulmonary tuberculosis," to emphasize the clinical, prognostic and therapeutic entity and the significance of close cooperation between the phthisiologist and the laryngologist.

2. The relationship between the general problem of tuberculosis and that of its laryngeal localization, with an analysis of the individual constitutional and local sensitivity to the specific tuberculous allergy and the factor of localization.

3. The problem of primary infection and endogenic spread in laryngeal tuberculosis, with references to various authors.

4. Pathologic anatomy and physiology of localized edematous infiltration and ulceration in laryngeal tuberculosis. The influence of the sodium ion and the significance of the potassium ion in inflammation and of the calcium ion in dehydration.

5. Statistics on laryngeal tuberculosis and its relationship to phthisiology. Signs and symptoms, diagnosis, prognosis of laryngeal tuberculosis with special consideration of dysphonia, dyspnea and pain.

6. Dysphagia, paresthesia, cenesthesiopathy.

7. and 8. Clinical forms, histories and course of laryngeal tuberculosis.

Alexander [65] reviews laryngeal tuberculosis for the physician who is in general practice. He states that the disease is usually secondary to pulmonary tuberculosis and is usually caused contact infection, occasionally by hematogen infection. Isolated tuberculosis of the larynx rare. The complication occurs most frequen between the second and the fourth decade of l and the incidence in men is three times as h as that in women. Clinically one finds laryng tuberculosis as a complication in about 20 30 per cent of patients with tuberculosis wh the observations at autopsy show the incidence go as high as 50 per cent.

Pathologically one has to differentiate betwe tuberculous infiltration, ulceration, perichond tis and tuberculoma.

The scarcity of symptoms at the incipient sta of laryngeal tuberculosis necessitates rout laryngologic examination of every patient w pulmonary tuberculosis, while each patient w stubborn and refractory laryngitis should ha a thorough pulmonary check-up.

The diagnosis of laryngeal tuberculosis c usually be confirmed by indirect laryngosco which might be completed by roentgen exa nation or direct photography. The differen diagnosis has to exclude syphilis and cancer the larynx. One should not forget that eit disease might occur combined with tuberculos The course and prognosis depend largely on general allergic condition of the tuberculo patient.

Laryngeal tuberculosis is no contraindicat to pulmonary collapse therapy and, according the author, is not an indication for interrupt of pregnancy.

For the cure, the general treatment of tub culosis is of primary importance (outdoor r diet, injection of a gold compound). In so cases the condition responds well to local me cation, radiation and cauterization. In the ev of dysphagia, roentgen treatment has pro helpful.

Castiglioni Alonso [66] states that laryngeal berculosis is usually secondary to pulmon

64. Acevedo Sojo, J. T.: Laryngopulmonary Tuberculosis, Rev. med. y cien. afines **2**:561 (Aug. 30); 640 (Sept. 30); 723 (Oct. 30); 820 (Nov. 30); 897 (Dec. 30) 1940.

65. Alexander, H.: Laryngeal Tuberculosis, Med. Welt **14**:397-401 (April 20) 1940.

66. Castiglioni Alonso, J. C.: Laryngeal Tuber losis, Rev. de tuberc. d. Uruguay **9**:269-276, 1940.

rculosis but that exceptionally it is primary. is more frequent in men 20 to 40 years old, ough the incidence in children is greater than monly suspected. Subjective symptoms in- le respiratory disturbances, vocal changes, gh, pain, dysphagia and occasionally dyspnea. laryngologic aspects are congestion, infiltra- , the participation of the vocal cords and rations. Nothing is said of prognosis and tment. No bibliography is added.

accarani [67] states that in view of the marked uency of clinical complications due to patho- c changes of the upper respiratory tract in ents with pulmonary tuberculosis he recom- ds summarizing the syndrome under the prehensive term "tuberculosis of the respira- tract." He maintains that impairment of the nomous nervous system (vagus and sympa- ic) is the outstanding cause of the frequency pread of tuberculous infection to the upper iratory tract. This neurovegetative appa- s combines both the upper and the lower ion of the respiratory tract into an indivisible y and is responsible for the physiologic regu- ns of the cellular metabolism and of the unization response of the tissue.

anyai [68] reports on the topical application od liver oil in 270 cases of extrapulmonary rculosis, in which it was safely used, partly encouraging success. Pharyngeal and geal ulcers particularly showed rapid epi- zation after application of cod liver oil and mproved and accelerated tendency to heal. avorable therapeutic response was seen in rculosis of the larynx with localized infiltra- s and with vegetative granulations. Laryn- tuberculosis with marked edema proved r resistant to treatment. The author men- s a series of cases in which other extrapul- ary complications were successfully treated cod liver oil but these cases have no bear- on the particular field of interest. The oil rayed into the larynx with an atomizer three s a day. Of 91 patients who were treated eriods of from two months to one and a half s, 26.3 per cent showed the condition of the x unimproved (8 died); 46.2 per cent im- ed; 27.5 per cent, healed. The lesions were arious types—infiltration, ulceration, inter- noid vegetation, edema (the last was more lant). Banyai also treated tuberculosis of the tongue, the tonsils, the posterior pillars, and small areas of the pharynx with favorable results.

Binshtok [69] extracted all cases of sputogenous laryngeal tuberculosis out of the clinical material which he had observed in a ten year span, from 1928 to 1938, and classified them according to the nature and the extent of the underlying pulmonary disease. Statistical tabulation showed that 94 per cent of the cases of contact laryngeal tuberculosis were in the group in which there was also advanced fibrocavitary pulmonary tuberculosis, 5 per cent fell into the group in which there were associated exudative infiltrations and pneumonic spreads, and the remaining 1 per cent was in the group in which there also was lobar and lobular tuberculosis with fulminating involvement and usually fatal outcome. Classification of the cases of pulmonary tuberculosis with secondary laryngeal tuberculosis of the Moscow District Institute for Tuberculosis showed that 5.5 per cent belonged to the group in which the pulmonary lesions were minimal; 24.4 per cent, to the group in which the lesions were moderately advanced, and 64.7 per cent, to the group in which the process in the lungs was far advanced. The author observed that in cases in which the lesions are bilateral, there is frequently a direct proportion between the extent of the pulmonary process and the intensity of the laryngeal involvement—a clinical observation which he considers worthy of further investigation.

Noto Campanella [70] observed laryngeal tuberculosis in 6 children from 9 to 13½ years old and draws the following etiologic and clinical conclusions:

1. The spread of the tuberculous infection takes place by the canalicular route in the large majority of cases. Exceptionally there might be a hematogenous and an ascending lymphogenous spread.

2. The cervical lymph glands are usually considerably enlarged, and the degree of swelling is in proportion to the seriousness of the laryngeal involvement. Caseation is rare.

3. Laryngeal tuberculosis is most commonly represented by infiltration, which might show various forms. Ulcerations are secondary manifestations and are rarely observed, as the children usually succumb before showing such an advanced syndrome.

4. The vegetative infiltrative form is typical for juvenile patients with laryngeal tuberculosis, particularly those who are encountered during their puberty.

5. Acute miliary tuberculosis of the larynx is exceptionally rare in children, probably because of the local immunity of the larynx in infancy.

Baccarani, C.: Laryngeal Tuberculosis, Pulmo- Tuberculosis and the Anatomical Physiological of the Respiratory Tract, Oto-rino-laring. ital. 9-221 (May) 1940.

Banyai, A. L.: Cod Liver Oil as Local Treat- for Tuberculous Lesions, Brit. J. Tuberc. **34**: 6 (July-Oct.) 1940.

69. Binshtok, M. S.: Clinical Anatomical Grouping of the Principal Forms of Laryngopulmonary Tuberculosis, Probl. tuberk., 1940, no. 6, pp. 30-38.

70. Noto Campanella, C.: Laryngeal Tuberculosis in Childhood, Med. ital. **21**:295-307, 1940.

6. Laryngeal tuberculosis in infancy follows a rather torpid course and may remain stationary for a considerable length of time.

De Souza Soares [71] observed relief of dysphagia in a patient with tuberculous laryngitis after a pleural-mediastinal rupture which produced moderate emphysema of the cervical region. This observation persuaded him to induce artificial emphysema of the cervical region by insufflating 80 to 100 cc. of air with a pneumothorax machine. In 17 cases of tuberculous laryngitis this method gave symptomatic relief from dysphagia. The insufflations are painless and may be repeated.

Duarte Moreira [72] found secondary tuberculous laryngitis in 35 per cent of female patients with systemic tuberculosis—mostly of the group with far advanced lesions. He described the principal sources of ultraviolet rays and the most frequently used apparatus, with special consideration of the Cemach lamp and the technic of its application. After quoting the therapeutic results of various authors, he submits his own experiences with ultraviolet radiation in the treatment of tuberculous laryngitis, which he considers rather satisfactory. The dysphonia disappeared in about 33 per cent of the cases and was lessened in 50 per cent; odynophagia disappeared in 100 per cent. The lighter infiltrations were cured in 63 per cent and reduced in 31 per cent; the remaining 6 per cent showed no benefit from treatment. Further advanced ulcerations were healed in 14 per cent, reduced in 64 per cent and unchanged in 22 per cent. Thirty patients were submitted to intralaryngeal actinotherapy, which cured 40 per cent of them and improved the condition of 47 per cent; in 13 per cent the condition was unchanged. Summing up his material, the author considers ultraviolet radiation useful, provided the patients are carefully selected. Ten case histories and several illustrations of laryngologic findings are added.

Gibelli [73] reminds otolaryngologists of the possibilities and the indications for tracheolaryngostomy in patients with laryngeal stenosis of tuberculous origin. He illustrates his paper with the cases of 2 patients operated on successfully by him, one of whom he followed up for three years without observing untoward results.

[NOTE.—I have found tracheotomy for tuberculous laryngeal stenosis necessary only six times in twenty years. George E. Wilson.]

Jouan [74] reports the case of a patient referred to him with the tentative diagnosis of laryngeal tuberculosis. A roentgenogram of the chest revealed a cavity the size of a tangerine at the upper left and a hydatid cyst of approximately the same size at the upper right in the pulmonary field. Questioning brought to light that the patient had evacuated some thick whitish material containing tissue fragments, either by expectoration or vomiting, after the hydatid cyst on the left had ruptured. The cyst on the right was removed surgically, and the patient recovered. According to the author, several patients with cystic nontuberculous cavitation have been referred to sanatoriums for patients with tuberculosis and have been exposed subsequently to tuberculous infection. The greatest care is therefore advocated in differentiation between hydatid cysts and tuberculous cavities.

Leshchinskiy [75] reports the case of a patient presenting a pedunculated tumor the size of a plum of the epiglottis, on the left, and an oval tumor, slightly smaller of the lingual tonsil, on the left. The tumors were removed with the patient under local anesthesia, and microscopic examination revealed the tuberculous nature of both. In such cases the differential diagnosis is to rule out benign tumors (fibroma), and careful general physical check-up should be made to confirm or exclude a diagnosis of systemic tuberculosis and the specific nature of the tumor.

Lütgerath [76] reports a survey of 52 cases of abacillary laryngeal tuberculosis with predominantly good immunity and favorable prognosis. There was preponderant disease of the vocal cords and folds in contrast to the remaining parts of the larynx. Correlation of the roentgenographic pulmonary findings showed 10 cases with hematogenous disseminations, 32 with productive nodular cirrhotic tuberculosis and 10 with clear lungs (in the latter cases the laryngeal tuberculosis was probably of hematogenous origin, and this type might be interpreted as isolated metastasis occurring in the period of generalization). The hematogenous forms affect preferably the entrance of the larynx with tendency to spread to internal parts of the lar-

71. de Souza Soares, J. B.: A New Treatment of Odynophagia in Tuberculosis of the Larynx, Rev. Assoc. paulista de med. **16**:280-283 (April) 1940.

72. Duarte Moreira: Ultraviolet Rays for Treatment of Tuberculous Laryngitis, Rev. brasil. de oto-rino-laring. **8**:623-634 (Nov.-Dec.) 1940.

73. Gibelli, S. L.: Tracheolaryngostomy in Laryngeal Tuberculosis—A Clinical Note, Lotta contro la tuberc. **11**:372-376, 1940.

74. Jouan, S.: Hydatid Vomica Simulating Tuberculous Laryngitis, Semana méd. **2**:769-770 (Oct.) 1940.

75. Leshchinskiy, Y. L.: A Rare Case of Tuberlomas of the Epiglottis and Lingual Root, Zhur. nos. i gorl. bolez. **17**:75-76, 1940.

76. Lütgerath, F.: On Abacterial Laryngeal Tuculosis, Ztschr. f. Hals-, Nasen- u. Ohrenh. **45**:316 1940.

which might be caused by temporary bacillary dissemination except in those cases in which the hematogenous route is absolutely proved to have been the path of spread. In most of the 52 cases there was favorable regression with a comparatively good prognosis and a relatively short period of curing. Forty-one patients could be discharged after four months of sanatorium care.

Lukens [77] reports on his experiments with laryngeal tuberculosis in ambulatory patients. After criticizing the frequent omission of early routine laryngologic examination and the lack of prophylactic laryngeal care, he emphasizes that every patient with pulmonary tuberculosis is potentially a patient with laryngeal tuberculosis. The complication might occur in any stage; therefore, repeated laryngoscopic checkups are necessary even in the absence of symptoms. A perfectly normal larynx in a patient with pulmonary disease is exceptional. According to the degree and intensity of cough, there usually are various stages of laryngeal congestion and inflammation, which most frequently give a clinical impression of chronic catarrhal laryngitis. Implantation of tubercle bacilli in the larynx occurs frequently where there is damaged epithelium, which may or may not regenerate, but laboratory experiments have proved that implantation may occur also in the presence of intact mucosa. Naturally, congested and inflamed laryngeal mucosa presents a more favorable soil for the settlement of bacilli, especially in the presence of untreated nasal and pharyngeal infections, which facilitate laryngeal implantation. Generally speaking, one might say that a tuberculous ulcer has a tendency toward healing unless a secondary mixed infection opens the way to spreading. This event might explain the laryngeal breakdown in the presence of pulmonary improvement which is observed in some cases. It is the author's experience that early diagnosed laryngeal tuberculosis shows a more favorable course if nasal and pharyngeal pathologic conditions are promptly corrected.

In the diagnosis of laryngeal tuberculosis it should be kept in mind that the early stages frequently are asymptomatic. Suggestive symptoms which are often overlooked are mild hoarseness, roughening of the voice, sensation of dryness or irritation in the throat or vocal weakness. Dysphagia and odynophagia are usually associated with the more advanced stages of laryngeal tuberculosis. Laryngoscopic examination, which should be repeated at frequent intervals, shows that the posterior half of the larynx is most commonly involved. This fact and better visibility of the posterior lesion should not deceive the laryngologist as to the absence of foci in the anterior half; every technical precaution should be taken to obtain a clear view of the whole larynx, including the vocal cords in their full length and the posterior surface of the epiglottis. Finally, it should be kept in mind that the larynx of the tuberculous patient is subject to the same nontuberculous pathologic conditions as that of the nontuberculous one, and each form of irritation should receive prompt attention.

In treatment, aside from the management of laryngeal tuberculosis proper, which will be discussed presently, every pathologic condition of the nose and throat should be attended to. Surgical treatment of the nose can be undergone without risk; the same may be said of tonsillectomy performed with the patient under local anesthesia, unless the laryngeal tuberculosis is far advanced, but even then the tonsils might be removed by electrocoagulation in small and cautious installments.

The author's experiences with tracheotomy were rather discouraging because of the frequent infection of the wound with subsequent secondary infection of the pulmonary secretion. The operation never led to improvement of laryngeal tuberculosis except in 2 patients with moderately advanced tuberculosis; the larynx of each showed temporary improvement, but both patients died of their pulmonary disease.

Pneumothorax gives satisfactory results inasmuch as it eases the laryngeal irritation and decreases the amount of expectoration and therewith the possibility of sputogenous spread.

Electrocautery is the method of choice but demands cautious selection of patients by an experienced laryngologist, who avoids too hasty and too vigorous treatment. Electrocautery has also proved helpful in the reduction of turban epiglottidi and piriform arytenoids.

Another important factor of treatment is the alleviation of laryngeal and tracheal infection and of unproductive cough by intratracheal instillation of paramonochlorophenol in oil or 0.5 per cent menthol in oil. Chaulmoogra oil in full strength has also been used in the treatment of tuberculous infiltrations and ulcers.

Any of these measures should be used in conjunction with complete vocal rest.

At the end the author stresses the importance of individualized treatment in each case.

Oliva [78] remarks on the implantation and spread of the bacilli causing laryngeal tuberculosis. He gives a pathologic anatomic descrip-

77. Lukens, R. M.: The Larynx in the Tuberculous Patient, Tr. Am. Laryng. A. **62**:119-132, 1940.

78. Oliva, R.: Laryngeal Tuberculosis, Rev. brasil. de oto-rino-laring. **8**:35-42 (Jan.-Feb.) 1940.

tion of infiltrative ulcers, perichondritis and proliferations with ulcerations. He mentions as symptoms parasthenias, vocal changes like hoarseness and aphonia, dysphagia and respiratory obstruction. The clinical types are (1) superacute, (2) acute, (3) subacute and (4) chronic. The diagnosis is made by laryngoscopy. Treatment consists of rest in bed, silence, natural and artificial heliotherapy, irradiation with ultraviolet rays from a quartz lamp, use of the Wessely lamp, electrocautery, topical application of ethylaminobenzoate, inhalation of equal parts of orthoform and cocaine, and alcoholization or resection of the superior laryngeal nerve. The prognosis depends on the primary pulmonary tuberculosis. Laryngeal tuberculosis is more curable than is generally conceived.

Penna [79] interprets laryngeal tuberculosis as a special localization of the systemic infection and not as a complication of pulmonary tuberculosis. He admits that the pulmonary disease exerts an important influence on the laryngeal lesion through the mechanical process of coughing and the passage of secretion. The fact that laryngeal tuberculosis is so frequently encountered in patients with chronic and far advanced pulmonary tuberculosis is explained by the breakdown of the immunologic balance which secondarily activates latent laryngeal foci. The improvement in some cases of laryngeal involvement in the course of successful treatment of the pulmonary disease is also unspecific, according to the author, inasmuch as treatment and its beneficial results are just as unspecific as the systemic disease and tend to promote healing in any organic localization, be it pulmonary, laryngeal or any other. Three case histories are added, and the therapeutic value of chaulmoogra oil is mentioned.

Rickmann [80] treated the laryngeal tuberculosis of more than 200 patients with Cemach's ultraviolet ray lamp. In the first group, with pachydermic fibrotic infiltrations in the posterior part of the larynx, the condition proved to be refractory toward the treatment, which was to be expected. In the second group, with exudative laryngeal tuberculosis, a faster and increased reaction was seen, but in none of them did the larynx heal or even show the condition clinically improved. In the third group, comprising those with the productive form, the vegetations did not reveal either regression or growth. The reason for the inefficacy of treatment with ultraviolet rays seems to lie in the lack of penetration of the rays. Each treatment caused more or less violent reaction of the mucosa, but the tuberculous process was too deeply embedded for any benefit to be derived from such superficial radiation.

Stevenson and Heaf [81] reported the results of laryngoscopic examination of 2,831 patients with pulmonary tuberculosis, stating that 428 (15 per cent) were shown to have tuberculous laryngitis —figures which when compared with older statistics prove a decrease in frequency. The younger age group shows a predominance of the female sex, while in the advanced age groups men seem more frequently affected. The laryngeal complication often occurs in the second or the third year of the pulmonary disease. The prognosis depends largely on the age of the patient and on the nature of the pulmonary disease. Dysphagia was found more frequently (80 per cent) with the exterior ulcerative types of laryngeal lesions than with interior types, which show a better trend toward healing, especially if they are not ulcerative. Cauterization relieves pain and facilitates healing, but rest and silence are still the cardinal elements of treatment. Each patient suspected of having pulmonary tuberculosis should be examined with the laryngoscope repeatedly.

Theissing [82] succeeded in producing laryngeal tuberculosis by hematogenous infection in a series of 9 guinea pigs and 6 monkeys (Macacus rhesus). In 1 case the histologic slides showed a typical tuberculous lesion of the laryngeal mucosa. This study is of academic interest, according to the author, because human pathology has failed up to the present to give histologic proof of a hematogenous origin of laryngeal tuberculosis.

Turtur's [83] paper represents the summary of a lecture which was given during an otorhinolaryngologic seminar. He particularly emphasizes the work done by the Italian government in the prophylaxis and the treatment of tuberculosis.

Zobin [84] discusses the difficulty of the treatment of the dysphagia associated with laryngitis and his experience with the topical application of a mixture of tannic acid and alcohol, to which

79. Penna, M.: The Nature of Tuberculous Laryngitis, Rev. brasil. de oto-rino-laring. **8**:759-766 (Nov.-Dec.) 1940.

80. Rickmann, L.: The Treatment of Laryngeal Tuberculosis with Cemach's Ultraviolet Lamp, Beitr. z. Klin. d. Tuberk. **94**:301-308, 1940.

81. Stevenson, R. S., and Heaf, F. R. G.: Tuberculous Laryngitis: An Analysis of Four Hundred and Twenty-Eight Cases, Brit. M. J. **1**:164-169 (Feb. 3) 1940.

82. Theissing, G.: Experimental Studies on the Pathogenesis of Laryngeal Tuberculosis, Hals-, Nasen u. Ohrenarzt (Teil 1) **31**:172-187 (July) 1940.

83. Turtur, G.: Laryngeal Tuberculosis with Special Consideration Given to Treatment and to Medical and Social Prophylaxis, Boll. d. mal. d. orecchio, d. gola d. naso **58**:321-336, 1940.

84. Zobin, Y. S.: Application of Tannic Substance in the Treatment of Tuberculosis of the Upper Respiratory Tract, Especially in Dysphagia, Probl. tuberk. 1940, no. 6, pp. 39-48.

caine derivative might be added. Frequent ughing and expectoration, swallowing and eech keep the laryngeal structures in perpetual otion and hinder the process of healing. The ntinued secretion of the mucosa interferes with e adherence of analgesic drugs, cutting down e usefulness of topical applications. Further- ore, the abundant sensory innervation of the al pharynx and of the laryngeal structures xacerbates pain and dysphagia. The author ob- ined satisfactory results with the tannic acid– cohol mixture, which he found had an analgesic d bactericidal effect.

Looper's [85] article represents a well written bstantial clinical lecture on laryngeal tuber- losis, based on the study of about 500 patients. covers the incidence, the pathology, the diag- sis, the differential diagnosis, the prophylaxis d the treatment of the disease.

He found no relation between the disease and cupation.

It should be kept in mind that any pathologic ndition causing even superficial loss of epi- elium facilitates the implantation of tubercle cilli contained in the sputum. The frequency tuberculous involvement of any part of the ynx is in direct proportion to the exposure, e degree of irritation and the functional activity the part.

After hinting at the great variety of drugs and al applications tried and abandoned in the atment of laryngeal tuberculosis, the author orts on his results with electrocautery. With is procedure he obtained improvement or heal- in 65.5 per cent of the patients with moder- ly advanced tuberculosis and in 26.5 per cent the patients whose disease was far advanced. l the patients with moderately advanced tuber- losis showed some benefit from cauterization— re seemed to be no outright failure in this up. Aside from the satisfactory local effects, terization proved to have a favorable influence the patient's pulmonary and general condi- n. No bad results were encountered. Cauteri- ion was done with the patient under local sthesia by the indirect method at monthly in- vals. In conjunction with vocal rest or abso- e silence, it represents a valuable aid in the atment of laryngeal tuberculosis, which now ght be considered a curable disease if it is gnosed early and the treatment started prompt- Among the contraindications to the use of cautery, the author mentions a high eleva- n of temperature, pronounced asthenia and rked hypertension.

85. Looper, E. A.: Diagnosis and Treatment of yngeal Tuberculosis, M. Ann. District of Columbia 20-127 (April) 1940.

The laryngologist should never forget that laryngeal tuberculosis is a complication of tuberculosis of the lungs, and he therefore should at all times take into consideration the pulmonary condition of the patient and in this regard be guided by the clinician.

Randolph [86] mentions that one of the primary requirements for the treatment of tuberculous laryngitis is vocal rest. He therefore recommends the use of a small radio amplifier which makes whispered sounds easily understandable even in large rooms and allows the patient to engage in social intercourse without jeopardizing his cure. The device consists of a small radio transmitter in connection with an amplification unit placed on the other side of the room.

Cohen [87] writes an excellent thesis on the hematogenous form of laryngeal tuberculosis, describing its characteristic local lesions and general clinical course. He achieves a careful selection of cases by differentiating between hematogenous and sputogenous tuberculosis of the larynx as follows:

A. Criteria for hematogenous infection:

1. Laryngeal symptoms appeared in either a previously healthy individual or in one with an apparently quiescent tuberculous pulmonary lesion.

2. The sputum was free of tubercle bacilli (smears of concentrated specimens) at the time laryngeal tuberculosis was first detected.

3. The roentgenogram of the chest showed typical haematogenous lesions with no visible cavitations.

Additional evidence in some cases was:

4. Presence of other extrapulmonary lesions (besides intestinal).

5. Fairly recent miliary tuberculosis at necropsy.

B. Criteria for sputogenous infection:

1. Initial pulmonary lesion unilateral.

2. Appearance of symptoms and signs of laryngeal tuberculosis only after cavitary lesions in the lung and positive sputum had been present for a long period of time.

3. Progressive nature of the pulmonary lesion.

4. Absence of other extrapulmonary involvement (besides intestinal).

The author studied the case material at the Montefiore Hospital in the Bronx, New York, and found that over a period of six years there were about 250 cases of laryngeal tuberculosis, in 11 of which the findings complied with the strict criteria established by him for hematogenous infection, while in 44 they followed the

86. Randolph, H.: Radio Amplifier in the Treatment of Tuberculosis of the Larynx, Am. Rev. Tuberc. **41**: 660 (May) 1940.

87. Cohen, A. G.: Hematogenous Tuberculosis with Involvement of Larynx, Am. Rev. Tuberc. **41**:426-443 (April) 1940.

clinical pattern of hematogenous tuberculosis except for the presence of tubercle bacilli in the sputum on admission, in contrast to the finding in the 11 cases mentioned, so that altogether the hematogenous group comprised 55 cases. A critical review of the literature on the genesis of tuberculous laryngitis showed that the incidence of hematogenous disease varies from 11 to 40 per cent; with the more exacting classification of Cohen, the incidence of hematogenous tuberculosis of the larynx varies from 30 to 40 per cent.

Laryngeal lesions in the hematogenous group predominantly affected the extrinsic structures of the larynx (epiglottis, aryepiglottic folds and arytenoids), while the bronchogenic group was characterized by lesions of the intrinsic structures (true cords and interarytenoid space). The false cords were invaded equally in the two groups. The hematogenous involvement of the larynx is frequently symmetric, while the bronchogenic spread shows more often an asymmetric arrangement. The onset is insidious in the bronchogenic and acute in the hematogenous group.

A statistical tabulation of pulmonary and laryngeal symptoms in the hematogenous group is added.

Prognostic considerations showed that all patients with bronchogenic infection of the larynx died within one to two years after the development of the laryngeal lesion, while the group with hematogenous infection showed a mortality of 60 per cent of the 55 patients; 19 died of tuberculous bacillemia, 11 of progressive pulmonary tuberculosis and 3 of laryngeal tuberculosis. The remaining 22 were discharged from the institution and classified as follows: 5 with progressive pulmonary and laryngeal tuberculosis; 4 with fibroid tuberculosis whose sputum occasionally contained tubercle bacilli and who had active laryngeal tuberculosis; 9 who had active tuberculous laryngitis; 2 with inactive laryngeal disease, and 2 in whom the laryngeal status was unknown.

Howie,[88] of Glasgow, Scotland, examined 159 children with pulmonary tuberculosis in Mearnskirk Hospital for laryngeal involvement and found that 42.2 per cent of those with "open" tuberculosis had laryngeal lesions. The ages in this group varied from 4 months to 16 years. All had been in the hospital for periods up to seven years. The human type of bacillus was identified in material from 66 and the bovine type in that from 15. He states that infection with the bovine and that with the human type seem equally to produce laryngeal disease. The bulk of the incidence of laryngeal disease occurred in the group showing cavitation and bronchopneumonic lesions in the lungs. The symptoms are less pronounced in children than in adults, but the treatment is the same. It is difficult to enforce whispering, and galvanocautery has not been used. In the early stages of laryngeal disease in children there is seldom any pain even when the condition has advanced to perichondritis of the arytenoids or the epiglottis. A large proportion of these children had no hoarseness unless a tuberculous tumor interfered with the approximation of the cords. In children, as in adults, the common site of the lesion is the posterior part of the larynx, the interarytenoid area and the posterior half of the cords. The course of the disease is usually parallel to that of the lungs. He believes that laryngeal disease is due to implantation of bacilli from sputum.

Treatment of the laryngeal lesion was limited to vocal rest (enforced silence) and inhalations of creosote. All, however, had the benefit of high altitude, fresh air, good food, sufficient rest and artificial pneumothorax when indicated.

Donovan and Wigby[89] state that tracheotomy is a factor predisposing to the development of pulmonary tuberculosis and illustrate this by describing a case. After a short survey of the scanty literature on the subject, they report the case of a 44 year old woman who underwent tracheotomy for the relief of dyspnea caused by stenosing laryngeal carcinoma. A roentgenogram of the chest taken a few days after the operation gave no evidence of pulmonary tuberculosis. Thirty months later another roentgenogram taken during a routine check-up, revealed moderately advanced tuberculosis with cavitation in the upper lobe of the right lung. The sputum contained tubercle bacilli. Subsequent clinical and roentgen observation showed progression of the pulmonary lesion. This case is of academic interest because it proves that there is a possibility of tuberculous infection through a tracheotomy tube in an adult person. Naturally, the single report does not allow any generalization.

Roberts[90] uses and recommends for laryngeal tuberculosis the injection of a solution containing phenol ½ drachm (1.9 cc.), glycerin 2 drachms (7.7 cc.) and sterile water 1 ounce (31 cc.), to which procaine hydrochloride might be added if necessary. For a detailed description of the technic of treatment, the original article should be read.

88. Howie, T. O.: Tuberculosis of the Larynx in Childhood, J. Laryng. & Otol. **55**:269-281 (June) 1940.

89. Donovan, M. S., and Wigby, P. E.: Tracheotomy and Tuberculosis, Am. Rev. Tuberc. **42**:134-137 (July) 1940.

90. Roberts, J. R.: Treatment of Tuberculosis of the Larynx by Injection of Phenol Solution, Brit. Tuberc. **34**:133-136 (July-Oct.) 1940.

The method does not require more than a few injections and is usually followed by relief of pain and lessening of cough and of dysphagia, and these benefits in turn facilitate sleep and the intake of food. The treatment seems to be of symptomatic value. The needle is introduced externally through the skin at the thyroid notch and directed downward so that the medicine is delivered under the mucosa to the region of the submucous tissue of the ventricle.

Bueno,[91] after a few introductory remarks on the general nature and the mechanics of pain, the function of the larynx and the syndrome of dysphagia, gives a short review of the biologic changes of laryingeal tuberculosis, which he subdivides into (1) congestive changes, (2) infiltrations, i. e., subepithelial lesions with intact mucosa, which occur in about 80 per cent of the cases and (3) ulcerations. He then discusses pain in laryngeal tuberculosis and the significant topography and neuroanatomy of the superior laryngeal nerve.

Alcoholization and forcipressure of the superior laryngeal nerve are considered valuable help in the symptomatic treatment of laryngeal tuberculosis; the treatment relieves pain, alleviates inflammatory phenomena, lessens dysphagia and facilitates expectoration, and all this together assists the patient in the terminal stage. Six case histories and a bibliography of the neuroanatomy of the superior laryngeal nerve are added.

Hulse[92] states that hoarseness is a most constant symptom in laryngeal tuberculosis, yet the percentage of patients with hoarseness who have tuberculosis of the larynx is small. On the other hand, one might see extensive laryngeal involvement with little or no hoarseness. To simplify classification, the author distinguishes between intrinsic and extrinsic causes of hoarseness. Intrinsic causes are pathologic processes of the larynx itself while extrinsic ones are represented by involvement of the recurrent nerves and the branches of the vagus nerve, tuberculosis of lymph nodes, traction by fibrotic scars or tension on the recurrent nerves by the mediastinal shift in collapse therapy.

Mikhlin[93] recommends the application of silver preparations according to Moisseev in the treatment of tuberculous ulcers of the upper respiratory tract. Such preparations help clean up the common secondary infections frequently superimposed on the ulcers and give symptomatic relief by reduction of the perifocal inflammation and alleviation of the dysphagia.

Ilyish[94] reports his experiences with freezing of laryngeal tuberculous lesions with solid carbon dioxide. His material comprehends over 80 patients with extensive tuberculous lesions of the upper respiratory tract. The results were satisfactory in the majority, particularly in those with superficial and well defined lesions of the vocal cords, the false cords, the arytenoids and the interarytenoid spaces. The results were disappointing in those whose infection was far advanced and who were in poor general physical condition.

Freezing should not be applied in those whose disease is of the acute hematogenous type. This should be given time to stabilize before local applications of solid carbon dioxide are initiated. The treatment was of particular benefit for the symptomatic relief of pain in patients with dysphagia. A detailed description of the technic and remarks as to dosage and timing of applications are added.

Baron[95] presents the case of a boy 2 years and 8 months old who was examined by direct laryngoscopy. The findings were a turban-like swelling of the epiglottis, swelling of all the intralaryngeal mucosa, an elevation on the posterior end of the right vocal cord and granules on the left cord. A smear taken at the time showed 1 tubercle bacillus. It is rare to find tuberculous disease in an infant.

Wilson,[56] in an article dealing with the diagnosis and the treatment of laryngeal, oral, aural and tracheobronchial tuberculosis, states that the incidence of laryngeal tuberculosis is diminishing as a result probably of the increasing use of collapse therapy. Symptoms may appear relatively late; they are pain, soreness, hoarseness and, in more advanced stages, aphonia, dysphagia, tickling cough and dryness. The signs on laryngoscopic examination are infiltration, edema, erosion and ulceration. The cords are most frequently involved first. Laryngeal tuberculosis occurs most frequently between the ages of 18 and 35. Laryngeal tuberculosis develops in less than 5 per cent of patients with minimal pulmonary disease, in less than 10 per cent of patients with moderately advanced tuberculosis and in about 20 per cent of patients with far ad-

91. Bueno, F.: Considerations on Alcoholization and Forcipressure of the Superior Laryngeal Nerve in Laryngeal Tuberculosis, Rev. argent. de tuberc. **6**:167-176 (Oct.-Dec.) 1940.

92. Hulse, W. F.: Hoarseness in Laryngeal Tuberculosis, Am. Rev. Tuberc. **42**:776-781 (Dec.) 1940.

93. Mikhlin, E. G.: Treatment of Ulcerous Tuberculous Processes of the Oral Cavity and Larynx by the Hydrodynamic Method, Probl. tuberk., 1941, no. 1, pp. 59-62.

94. Ilyish, A. R.: Treatment of Laryngeal Tuberculosis with Carbon Dioxide Snow, Sovet. med. **5**:13-14, 1941.

95. Baron, S. H.: Laryngeal Tuberculosis in an Infant, Arch. Otolaryng. **33**:308-311 (Feb.) 1941.

vanced pulmonary tuberculosis. It is usually caused by surface infection in bronchogenic pulmonary tuberculosis, and it is relatively rarely due to hematogenous spread. The prognosis depends mostly on that for the pulmonary lesion. The prognosis of tuberculosis of the epiglottis is no longer as bad as it used to be. Among the therapeutic measures electrocautery seems to be the most effective. Light therapy has proved less valuable. Rest of the voice is of importance. Oral tuberculosis occurs much more seldom than larnygeal tuberculosis. It is always secondary to pulmonary tuberculosis, and the prognosis varies. Therapeutic measures are electrocautery, use of radiation from lamps and application of silver nitrate. Symptoms of tuberculous otitis media are stuffiness and discomfort in the ear, pain, impairment of hearing and tinnitus. The tympanic membrane usually ruptures spontaneously. The prognosis is good. The therapy consists in cleansing with antiseptic solutions. Symptoms and signs of tuberculosis of the trachea and bronchi are wheezing, rhonchi, dyspnea, cough, attacks of fever, variation in the daily amount of sputum and presence of tubercle bacilli in the sputum which is not explained by pulmonary findings. Therapeutic means are high frequency current, galvanic current, ultraviolet rays and silver nitrate. Laryngeal tuberculosis is rare in cases of tracheobronchial tuberculosis.

Belfort [96] reports the results of 1,000 instillations of chaulmoogra oil in approximately 100 patients with laryngeal tuberculosis. According to Fenton and Larcell, of the University of Oregon, the active factor in chaulmoogra oil is chaulmoogric acid, which is irritating and gives a burning sensation if applied to the oropharyngeal mucosa. Swallowing of a few drops might give considerable gastric irritation lasting as long as three days. When topically applied, it should cover the affected mucosal lesion completely. There is a decongestive effect on the tuberculous lesion with decrease of infiltration, epithelization and dehydration leading to lessening of the infiltrative edema. Laboratory experiments on cultures of tubercle bacilli prove that chaulmoogra oil inhibits the growth of the bacilli. Ulcerative lesions of the larynx showed a tendency to clear and heal under treatment with chaulmoogra oil, provided the ulcers were not too deep. The oil has a local antiseptic effect on the mucosa; it inhibits the formation of new ulcers and the implantation of fresh bacilli. Furthermore, it acts as a lubricant and so diminishes the traumatizing effect of cough and covers fissures in the mucosa, which present ready soil for the implantation of tubercle bacilli. Finally, the author emphasizes the relief of odynophagia and dysphagia.

Lukens [97] emphasizes again the importance of early and repeated laryngoscopy in every case of pulmonary tuberculosis, particularly in view of the fact that still many cases are recognized only at a considerably advanced stage of secondary tuberculous laryngitis. It should be kept in mind that laryngeal involvement may occur at any time in a case of pulmonary tuberculosis, regardless of the extent of the disease. Chronic catarrhal laryngitis is a syndrome frequently encountered in tuberculous patients, and its accompanying inflammation, infection and defects of the mucosal layer are predisposing factors for implantation of tubercle bacilli and the development of a specific lesion. Every pathologic condition of the upper respiratory tract should be corrected promptly, and unproductive cough should be allayed. The remarks on the objective and subjective signs and on the treatment of tuberculous laryngitis contain nothing new and are purely in the nature of a review. The author excels in his conservative attitude and advocates caution in the therapeutic approach to the disease. Patients should be selected carefully for electrocoagulation, and the extent of treatment at each session should be kept within safe limits. Likewise, diseased tonsils in patients with far advanced pulmonary tuberculosis should be treated by electrocoagulation slowly and with small dose at a time.

Martin [98] reports observations on tuberculosis of the larynx as follows: After bibliographic remarks on its occurrence, he discusses the mode of infection, with mention of sputum, blood and lymph, and the stages of infection, i. e., (1) simple catarrh, (2) ulceration and (3) perichondritis. The upper half of the larynx is most commonly involved, especially the arytenoids. In diagnosis he emphasizes the early signs and symptoms, which might consist of slight vocal alterations (huskiness), fatigue, mild aphonia, frequent clearing of the throat, extreme pallor of the palate, hypopharynx and larynx, especially in women, and infiltration of the false cord, also slight drag of one vocal cord on phonation. The arytenoids may show small tuberculous deposits, which might not cause any clinical symptoms. Later on one might find the well known morphologic changes which are general

96. Belfort, F.: One Thousand Instillations of Chaulmoogra Oil in the Treatment of Laryngeal Tuberculosis, Rev. brasil. de oto-rino-laring. **9**:211-216 (May) 1941.

97. Lukens, R. M.: The Larynx in the Tuberculous Patient, Arch. Otolaryng. **34**:110-116 (July) 1941.

98. Martin, G. E.: Observations of Tuberculosis of the Larynx, Edinburgh M. J. **48**:470-487 (July) 19

ssociated with extensive pulmonary involvement (infiltration, pseudoedema and ulceration). Finally, at the far advanced stage, one might find considerable infiltration, edema and deep ulceration with destruction of the epiglottis and perichondritis, which might lead to necrosis of the arytenoid cartilages. A review of 100 cases of tuberculous laryngitis with tabulations of the duration of huskiness, the condition of the larynx and the pulmonary status reveals that no relation exists between huskiness and the extent of the pulmonary condition or between the extent of the pulmonary disease and laryngeal involvement. The importance of frequently repeated laryngoscopic examinations is stressed, which in the majority of cases might be done by the indirect method and should be done by the direct method if doing it by the former is impossible.

Treatment embraces absolute vocal rest, treatment with the Kromayer or the Lomholt lamp in lupus, galvanocautery (contraindicated in lupus), diathermy in lupus, spraying with a solution of cocaine hydrochloride for advanced stages and injection of 80 per cent alcohol into the superior laryngeal nerve.

Lupus of the ear is much more uncommon today than it used to be. During the last fifteen years only 7 cases have been reported in Edinburgh, Scotland.

Summarizing, the author states that tuberculous laryngitis is no clinical entity but a secondary manifestation of pulmonary tuberculosis. Extreme pallor of the pharynx, uvula and lateral pharynx and huskiness are early signs. The presence of laryngeal tubercles is no contraindication for pneumothorax treatment. Coexisting nasal and oral pathologic conditions should be corrected as early as possible. Galvanocautery is the method of choice for advanced laryngeal involvement. The results with chaulmoogra oil and light therapy are not convincing. The terminal stages demand palliative treatment—the relief of pain. The roles of early diagnosis, vocal rest and institutional care are emphasized.

Myerson [99] studied 166 pregnant tuberculous women seen by otolaryngologists during seven years. The pulmonary disease was active in 111 patients and inactive in 55. The larynx was involved in 38. One hundred and twelve, 27 of whom had laryngeal disease, were observed during the entire pregnancy.

The mortality rate for the 27 with laryngeal involvement was 55 per cent, while the rate for those with pulmonary disease was 8 per cent. Among those with laryngeal involvement 7 per cent showed the process arrested, as compared with 24 per cent among the women with pulmonary disease. These figures indicate plainly that the added burden of laryngeal disease influences unfavorably the prospect of a successful pregnancy. It is significant also that all patients with laryngeal disease who fared poorly had caseous pneumonic pulmonary tuberculosis; only those whose disease was arrested or whose condition was improved had productive lesions of the lung. In 10 patients with laryngeal disease the pregnancy was terminated. The procedures were: dilatation and curettage in 2; hysterectomy in 2; cesarean section in 6. The results were not encouraging: Tuberculosis was arrested in 2; the condition was unimproved in 4; 4 died. Severe pulmonary disease accounted for the deaths in this group. A large number of thoses with laryngeal complication whose pregnancy was permitted to continue to term had exacerbation of their pulmonary disease.

In addition to the fact that laryngeal tuberculosis adds an unfavorable factor to the prognosis, regardless of whether the patient is pregnant or not, there is a tendency on the part of the normal larynx to undergo certain changes during pregnancy. The term "laryngopathia gravidarum" has been given to this condition. The changes range from slight hyperemia to generalized edema. The edematous form can simulate a tuberculous condition.

Although edema of the larynx was prominent in several patients seen by Myerson, in only 1 did it become necessary to perform tracheotomy. However, some authors have reported tracheotomy performed in large numbers of pregnant women. Obstruction due to edema may occur with tragic suddenness in a tuberculous larynx during pregnancy. Such sudden swelling and obstruction of the airway probably account for certain cases of sudden death during labor. Opinions vary regarding the value of therapeutic abortion for pulmonary tuberculosis. Horn, Schaefer and Law, and others, have expressed the belief that abortion does not check tuberculosis in well controlled cases and that it may even be harmful. They also contend that in cases of far advanced disease there is nothing to be gained by abortion. Patients with extensive caseous pneumonic disease who are seen during the first three months of pregnancy should be caused to abort. If they are seen later and are doing well, they should be permitted to continue to full term, and a cesarean section should be done.

99. Myerson, M. C.: The Larynx of the Pregnant Tuberculous Patient, Dis. Eye, Ear, Nose & Throat **1**: 195-198 (July) 1941.

Brahy [100] outlines modern treatment of laryngeal tuberculosis as follows:

1. Silence.
2. Medication.
   (*a*) Oral hygiene (mouth wash).
   (*b*) Gargles, instillations, intratracheal injections, inhalations of oily solutions (oil of cajuput, menthol, eucalyptol, guaiacol), topical applications of lactic acid, trichloroacetic acid, cod liver oil and chaulmoogra oil—all of them with rather discouraging results and all tiresome for the patient; some of the drugs mentioned even increased cough and spasm of the glottis.
   (*c*) Insufflation: orthoform or cocaine.
   (*d*) Injection of the superior laryngeal nerve with procaine hydrochloride or alcohol.
3. Light treatment.
   (*a*) Radiation from the Kromayer lamp, quartz mercury vapor lamps or the Wessely lamp.
   (*b*) Heliotherapy.
4. Surgery.
   (*a*) Resection of the superior laryngeal nerve for symptomatic relief.
   (*b*) Tracheotomy for complete or prolonged rest of the larynx.
   (*c*) Electrocoagulation (for diffuse edema of the arytenoids).

The prognosis is still grave but less hopeless than it was considered years ago. Decisive for the outcome of laryngeal tuberculosis is the course of the pulmonary condition.

Vandevere [101] states that laryngeal tuberculosis occurs as a complication in about 12 to 45 per cent of cases of pulmonary tuberculosis, according to the degree of advance of the basic pulmonary disease.

The symptoms are change of voice, vocal fatigue, sometimes pain (according to localization) and dysphagia.

In diagnosis one should differentiate tuberculosis from syphilis and cancer and should keep in mind that any two of the three conditions might occur combined. Biopsy might decide but is not without risk in tuberculosis and cancer. It should be undertaken in a state of complete surgical preparedness.

As to prognosis, laryngeal involvement decreases the chances of a favorable outcome in 50 per cent of patients with tuberculosis. In spite of the decrease in incidence with modern therapy, it always should be kept in mind that laryngeal tuberculosis is a serious complication, especially the extrinsic forms.

Of basic importance for the success of treatment is early diagnosis and vocal rest (either whispered voice or complete silence are essential). Heliotherapy applied by means of the Verba laryngeal mirror, which enables the patient to reflect the sun's rays into his larynx, might prove helpful in carefully selected cases. The author gives seventeen references for the use of the electrocautery and its results. He reports his own observations on 100 patients with laryngeal tuberculosis. He applied the cautery to approximately 50 per cent of them, particularly those in whom ulceration was present or developed later.

Spencer [102] describes the genesis, the clinical findings and the treatment of laryngeal tuberculosis. He states that whether the larynx becomes infected by contact with bacilli-laden sputum or by metastasis is difficult to prove even at autopsy. Investigations have shown that nearly all of the structures and organs of the upper respiratory tract contain a few tubercle bacilli even in persons who show no clinical involvement of this area before death. Laryngeal tuberculosis is almost always chronic from the beginning, but acute and subacute exacerbations are not uncommon.

Hoarseness is the first symptom and may be present only in the morning or after coughing. It may be followed shortly by aphonia and difficulty in swallowing. Severe pain is a late symptom, but any pain indicates an unfavorable prognosis. Dyspnea appears if there is narrowing of the lumen of the larynx and may be serious if there is bilateral paralysis of the abductor muscles. Objectively, the larynx may be pale, as most tuberculous patients are anemic, but it may be red if there is much cough. Infiltration of the interarytenoid sulcus is an early sign. If the infiltration spreads to involve the arytenoid cartilages, these become enlarged. Ulcers may form. Edema is a late sign and means that the circulation has been interfered with. Unless fibrosis occurs, the patient becomes progressively worse. Too much fibrosis may cause cicatricial stenosis. Perichondritis and chondritis are usually rapidly fatal. A differential diagnosis between tuberculosis, syphilis and malignant growth must be made.

In treatment, cauterization is the most important procedure. Vocal rest is vitally important. Heliotherapy, either with reflected sunlight or with ultraviolet radiation, may aid. Oil spray

100. Brahy, J.: Modern Treatment of Laryngeal Tuberculosis, Union méd. du Canada **70**:954-955 (Sept.) 1941.

101. Vandevere, W. E.: Laryngeal Tuberculosis and the Electric Cautery, Dis. Eye, Ear, Nose & Throat **1**:345-349 (Nov.) 1941.

102. Spencer, F. R.: Laryngeal Tuberculosis with Some of the More Recent Advances in Treatment, Arch. Otol., Rhin. & Laryng. **50**:735-744 (Sept.) 1941; abstracted, Arch. Otolaryng. **37**:111 (Jan.) 1943.

nd drops may be soothing, and the use of 20 r cent chaulmoogra oil is advocated by some. o allay pain, alcohol may be injected into the perior laryngeal nerve. Ionization, special ctrodes being used, may relieve pain. Chemo-rapy has brought no striking results in con-olling the lesions. Tracheotomy may be re-ired to prevent asphyxia. Collapse therapy believed to prevent laryngeal complications in ny cases. If the lesion is confined to the iglottis, amputation of this may prevent spread the infection. Gastrostomy may be required keep the patient with advanced laryngeal ions from slow starvation due to painful swal-wing.

Mondadori and Faria Pereira [103] report on dine iontophoresis for the relief of dysphagia tuberculous laryngitis, which was first sug-sted by R. Grain in 1939. The authors give detailed description of the technic of applica-n, including apparatus and dosage. They add report of a case of their own in which they plied the method successfully. The only con-indication for electric anesthesia, according to ain, is extensive laryngeal edema.

Juan C. and Hector A. Castiglioni Alonso [104] te that stenosis in the course of laryngeal berculosis may either be acute and temporary, used by edema, or infiltrative or ulcerative. it might be chronic, caused by steadily pro-ssive infiltration or papillomatous growth. ronic obstruction may be caused by a fibroid berculoma or may occur in the course of ryngeal lupus. The authors observed that ob-ruction is usually regressive and rarely neces-tates tracheotomy. Progressive stenosis in ryngeal tuberculosis is comparatively rare, so at the authors thought it worth while to illus-te it by describing a case in which trache-omy with insertion of a cannula and ordectomy were required. Histologic slides e reproduced in addition.

In a commentary on a case of laryngopulmon-y tuberculosis, Raimondi and Nijensohn [105] ve a case history, roentgenograms of the chest d laryngeal photographs. The patient was ated with pneumothorax and with ultraviolet ys from a quartz lamp, and his condition im-oved.

Horgan [106] observed a tuberculous granuloma of the left ventricular band in a patient complaining of dysphonia and aphonia, evidently caused by progressive laryngeal stenosis. The roentgenogram of the chest was normal and examination of the sputum gave negative results. Tracheotomy was performed with the patient under local anesthesia and brought prompt relief of the dyspnea. After spread of the tuberculous disease to the right side of the larynx and development of dysphagia, the patient underwent gastroenterostomy but finally died of inanition. No autopsy was performed. A short discussion of the literature is added.

Dworetzky and Risch [107] state that laryngeal tuberculosis is definitely on the decline. The incidence dropped from 25.6 per cent in 1914 to 14.6 per cent in 1934 and to 3.6 per cent in 1941. This percentage is based on 500 cases of tuberculosis for each year. The decline is due to improved investigation of patients, improved methods of diagnosis, earlier treatment and increased employment of collapse therapy.

Laryngeal tuberculosis is always secondary to pulmonary tuberculosis, and the larynx becomes infected chiefly in two ways: 1. By bacilli implanted on the surface. This usually occurs in the bronchogenic type of pulmonary tuberculosis, in which the tubercle bacilli invade the larynx by penetrating the mucous membrane. 2. By bacilli conveyed through the blood stream. This form of invasion usually occurs in the hematogenous form of pulmonary tuberculosis, in which the larynx often becomes involved simultaneously with the lungs. Tuberculosis of the larynx therefore occurs both in the bronchogenic and in the hematogenous type of pulmonary tuberculosis, but its clinical manifestations differ immensely in the two types, and unless the complication is properly recognized and differentiated, one will err greatly both in the prognosis and in the treatment. In attempting to make a differential diagnosis in these two types of laryngeal infection, it is well to remember the following distinguishing characteristics of the bronchogenic type:

1. The onset is insidious.

2. Examination of the chest often reveals physical signs indicative of pulmonary involvement.

103. Mondadori, E. C. F., and Faria Pereira, F.: mptomatic Treatment of Dysphagia by Electric Anes-sia, An. paulist. de med. e cir. **42**:501-505 (Dec.) 41.

104. Castiglioni Alonso, J. C., and Castiglioni Alonso, A.: Stenosing Laryngeal Tuberculosis, Rev. de erc. d. Urúguay **10**:434-439, 1942.

105. Raimondi, A. A., and Nijensohn, M.: A Com-ntary on a Case of Laryngopulmonary Tuberculosis, ch. argent. de tisiol. **18**:365-374 (July-Sept.) 1942.

106. Horgan, J. B.: Tuberculous Laryngeal Infiltration of Over Seven Years' Duration Resulting in Complete Occlusion of the Larynx and Cricopharynx in a Male in His Seventh Decade, J. Laryng. & Otol. **57**: 26-29 (Jan.) 1942.

107. Dworetzky, J. P., and Risch, O. C.: Laryngeal Tuberculosis: A Study of Five Hundred Cases of Pulmonary Tuberculosis with a Résumé Based on Twenty-Eight Years' Experience, Arch. Otolaryng. **35**:682-683 (April) 1942.

3. The sputum is often positive for the tubercle bacilli, while in the hematogenous type the sputum is usually negative, especially in the beginning.

4. Roentgenograms of the chest are characteristic, showing infiltration of one or more of the lobes, often with cavitation.

5. The first symptom is usually hoarseness or irritation in the larynx, which necessitates frequent clearing of the throat.

6. The laryngeal lesion is usually limited to a portion of the larynx, most often to the posterior commissure or to one or both vocal cords.

7. The larynx is usually involved alone, and extension to other parts, such as the tonsils, pharynx or uvula, is rare.

8. The prognosis, as far as the larynx is concerned, is usually good, and it is particularly favorable when collapse therapy is successfully applied.

9. The laryngeal lesions usually require little treatment.

Rodríguez [108] relates that three routes have been accepted to explain laryngeal tuberculosis in the presence of pulmonary tuberculosis: the lymphatic, the hematic and the bronchial. It has not yet been properly proved that the larynx may be involved by way of the lymphatics. The author's observations seem to indicate that bronchogenic infection has been rather exaggerated: His statistics show that only 33.3 per cent of patients with tuberculous laryngitis had bacilli in their sputum, while 26.9 per cent were never observed to have bacilli in their sputum. In cases of closed pulmonary tuberculosis the bronchial route cannot be accepted. Even in cases of open pulmonary tuberculosis the infection may spread to the larynx as well as to other organs by the blood stream. Bronchogenic spread usually causes lesions of the glottis, the anterior commissure, the vocal cords and the posterior laryngeal wall. These lesions are usually ulcerative. Lesions supposedly caused by bacilli from the blood stream involve the supraglottic area, the ventricular bands and the epiglottic and aryepiglottic folds. In this type of spread the epithelium does not succumb even in advanced lesions. The prognosis of hematogenous laryngeal tuberculosis varies. Sometimes the spread of the infection is small, with only slight congestion and infiltration of the arytenoids, the epiglottic folds and the vocal cords. Healing usually goes hand in hand with that of the pulmonary lesion. In other cases progressive, deep ulcerations occur, of which the author has observed occasional healing. This leads either to fibrous encapsulation and development of scar tissue around the ulcer or to epithelial proliferation at the site of the ulcer.

108. Rodríguez D., M.: Hematogenous Laryngeal Tuberculosis, Rev. otorrinolaring. **2**:9-13 (June) 1942.

McCay and Hawkins [109] give a review of 2 cases in which ultraviolet radiation from th Cemach lamp was used. In 12 the laryngea condition improved; in 6 it remained unchanged and in 6 it became worse during treatment. Th improvement was particularly evident whe ulceration was present. Of 6 patients with dys phagia, 4 were relieved. The authors give careful tabulation showing the results of exam nations of sputum, the pulmonary findings, th symptoms on admission, the laryngoscopic find ings, the treatment (number of exposures) an the symptoms after treatment, and summarizin comments on each case.

Cemach [110] calls attention to a lamp espe cially devised by him for the application of ultra violet radiation to the larynx and first describe by him in London in 1928; it was then recom mended for the treatment of laryngeal tubercu losis in Leipzig in 1931. In the past years th treatment of laryngeal tuberculosis with ultra violet radiation has caused controversy, wit reports of failure on one side and reports success on the other. Therefore the author fee compelled to make some further comments o the method of treatment initiated by him.

The main advantage of the Cemach lamp lies i the close contact with the diseased tissue, whic makes it more effective than other more distan sources of radiation. Another favorable facto is the central position of the burner inside th larynx, which lets the rays emanate radially attack also the affected lateral walls of th larynx. The ultraviolet rays affect only the su face of the mucosa; therefore the main indica tion for their use is a superficial lesion, espe cially the average tuberculous ulcer, which usu ally disappears within a few weeks. The dee ulcer is more refractory but persistent irrad ation is usually effective, shown clinically by th decreasing dysphagia and the relief of pai which facilitates the intake of food. Tubercu lous infiltrations respond more slowly but als improve on persistent and patient application The sputogenic infection usually responds bett than the hematogenic.

For deeper lesions the ultraviolet ray trea ment might be combined with electrocauteriza tion.

In concluding his paper the author says th not every patient with laryngeal tuberculos

109. McCay, A. W., and Hawkins, F. S.: A Revie of Tuberculous Laryngitis with Ultraviolet Thera Using the Cemach Lamp, J. Laryng. & Otol. **57**:36 377 (Aug.) 1942.

110. Cemach, A. I.: Some Further Remarks on t Treatment of Laryngeal Tuberculosis by Direct Irr diation, J. Laryng. & Otol. **57**:366-368 (Aug.) 1942.

s eligible for this treatment and that in spite f all the progress made in the therapy of this isease in recent years the prognosis is still ncertain.

The Cemach lamp has been used also with ood results in the treatment of oral, pharyn- al and epipharyngeal tuberculosis.

Spencer [111] describes the cases of 2 South frican natives with what was apparently aryngolaryngeal tuberculosis. The clinical istories do not supply diagnostic proof as to e specificity of the lesions. The author claims have encountered similar cases of tubercu- us laryngitis without pulmonary involvement llowing the ingestion of food that was possibly fected with tubercle bacilli. Abdominal pain as the initial symptom. The patients usually ffered from dysphagia and died of starvation.

Donnelly [112] illustrates the significance of yngeal symptoms, chronic hoarseness and sore roat as premonitory signals of symptomatic berculosis. Among 1,800 patients he found , i. e., approximately 1.5 per cent, who pre- nted tuberculous laryngitis and only later evi- nced pulmonary tuberculous involvement. An alysis of the data on these 26 patients who owed evidence of tuberculous laryngitis on mission is set forth as follows: Age and sex: here were 17 men and 9 women. The group the third decade of life was larger than the maining age groups. The average age was 40 ars for the males and 27 years for the females. mptoms: sixteen showed hoarseness; 4 had re throat; 6 had both symptoms. Involve- nt: In 11 this could be classified as severe; 8, as moderate; in 7, as slight. Sputum: e specimens from 21 patients contained ba- li; those from 5 revealed no bacilli. After even year period of observation, 19, i. e., 73 r cent, were dead and 7, i. e., 27 per cent, re apparently cured. The interim period tween the appearance of laryngeal symptoms d the admission to a sanatorium averaged six nths.

The author emphasizes the importance of early gnition of the tuberculous nature of laryn- is in patients in whom it occurs before the velopment of pulmonary or systemic signs. Any onic laryngeal lesion necessitates roentgen mination of the chest and examination of sputum in order to rule out pulmonary tu- culosis.

The roentgenographic findings were as follows: Twelve patients had moderately advanced, 14 far advanced, pulmonary tuberculosis. In none could the pulmonary involvement be called minimal. In 16 (6.15 per cent) the lesions were productive; in 9 (34.5 per cent), exudative.

A study of the site of the involvement of the larynx as related to the type of pulmonary disease showed intrinsic involvement in 15 patients and extrinsic involvement in the exudative group, 11 patients.

The number with intrinsic infection was about twice the number with extrinsic infection while in the group with productive lesions there was equal incidence of the two types. Analyzing separately the data on 17 patients whose disease was fatal, the author finds that 11 had extrinsic and 8 intrinsic involvements. The apparently cured patients belonged all to the group with the intrinsic type, which quickly subsides, presenting a better prognosis. The exudative type of pulmonary disease proves more favorable than the productive.

With regard to the predominating type of laryngeal lesion he finds infiltration in 12 patients (7 of whom died), ulceration in 7 (all of whom died) and tuberculoma in 2 (both of whom were apparently cured).

In his summary he states that his survey of 26 cases of laryngeal tuberculosis with underlying manifestations of pulmonary tuberculosis shows the importance of excluding pulmonary tuberculosis in every case of chronic hoarseness or sore throat. The diagnostician should not be deceived by the apparent well-being of the patient, which together with the isolated laryngeal symptoms might and frequently does camouflage pulmonary or systemic tuberculosis. The fact that in all the patients moderately or far advanced pulmonary tuberculosis developed shows that laryngitis is not a sign of early tuberculosis. The prognosis and the treatment depend on the location and the type of the laryngeal tuberculosis.

Mann [113] reports that the prognosis depends on the nature and the extent of the laryngeal involvement and on the pulmonary and the general condition of the patient. Treatment includes inhalations, spraying and application of medicinal preparations, such as cod liver oil, chaulmoogra oil, lactic acid, mild protein silver, orthoform and a cocaine hydrochloride–epinephrine hydrochloride spray. Most of them are of uncertain efficacy. Attention is called to the Wolfenden method for the relief of dsyphagia. Injections of

11. Spencer, H. A.: Disease Caused by the Eating Uncooked Flesh of Dead Animals, South African J. **16**:367-368 (Oct. 24) 1942.

12. Donnelly, J. C.: Pulmonary Tuberculosis Masquerading as Laryngitis, J. A. M. A. **120**:675-679 (Oct. 1942.

113. Mann, B. T.: Laryngeal Tuberculosis, Practitioner **148**:231-235 (April) 1942.

alcohol, vocal rest, ultraviolet ray therapy, electrocautery and the treatment of the pulmonary condition by institutional care and collapse treatment, if necessary, are given brief mention.

This paper by Dworetzky and Risch[114] contains substantially the same material as the one read at the meeting of the American Laryngological, Rhinological and Otological Society, Inc., held in Los Angeles, June 15 to 18, 1941 and reported in the ARCHIVES OF OTOLARYNGOLOGY in April 1942, which is considered in this review on page 453—the only difference being that the bronchogenic and hematogenous types are presented in tabulation form so that comparison may be more readily made. It is of interest for didactic reference.

McConkey[115] states that there has been a marked decline in the incidence of laryngeal tuberculosis during recent years. Some clinicians attribute this directly to the increasing frequency of collapse therapy. McConkey, however, thinks that the increased prophylactic use of cod liver oil and tomato juice is a determining factor in the prevention of laryngeal tuberculosis. To prove his point he excludes from his statistical considerations all patients who received any form of collapse treatment. He finds that, with 420 patients who did not receive cod liver oil and tomato juice, laryngeal tuberculosis developed in 14, or 3.3 per cent, during their residence at Ray Brook Sanatorium, while with 371 patients who did receive the prophylactic remedy, the complication developed in only 4, i. e. 1 per cent. Autopsy studies gave analogous figures. In a group of 71 patients who had not received cod liver oil and tomato juice and a group of 30 patients who had received them during life, necropsy revealed laryngeal tuberculosis in 14, or 36 per cent of the former and 4, or 13 per cent of the latter group.

Summarizing his clinical and necropsy observations, he states that the incidence of laryngeal tuberculosis was three times greater in patients not treated with cod liver oil and tomato juice than in those who did receive the remedy. This observation coincided with the increase in the sale of tomato juice in the United States, which multiplied one hundred fold during the period from 1929 to 1941.

Heaf and his collaborators[116] give an interim report on their clinical experiments with promin (sodium p,p'-diaminodiphenylsulfone-N,N'-di-dextrose sulfonate). Among the 19 tuberculous patients were 4 with laryngeal tuberculosis, in 2 of whom the lesions were treated with a powder consisting of promin, orthoform and starch in equal amounts, insufflated directly on the involved tissues through a Ledue tube. The lesions of these 2 patients were treated for a period of two months without showing any improvement on laryngoscopic examination. The larynx of the third patient was painted twice a day for three weeks with a mixture of "promin and glycerin" (equal amounts of the two) and showed marked decongestion. The fourth patient whose lesion was sprayed twice daily for eighteen days with a 20 per cent aqueous solution of promin and then painted with the mixture of promin and glycerin once a day for a week, also showed some improvement. The reseults in the last 2 patients are promising enough to encourage further study of the local application of promin as a treatment for laryngeal tuberculosis.

Proctor[117] made an elaborate study of the extent of tuberculous laryngitis in 600 Negro patients. Of these, 14 per cent had minimal, 36 per cent moderately advanced and 49 per cent far advanced pulmonary tuberculosis. This adds up to 99 per cent; the residual 1 per cent proved later to be nontuberculous. About 30 per cent of the 600 patients had evidence of tuberculous laryngitis.

Proctor classifies the laryngeal conditions as follows: (1) hyperemia, (2) edema, (3) thickened mucous membrane, (4) redundant mucous membrane and nodular outgrowth, (5) superficial ulceration and (6) destruction of the deeper laryngeal tissues. He describes the early and the advanced stages of laryngeal tuberculosis and the symptoms therewith, which have only reminiscent value for the reader. There follows a statistical extraction of the case material, amplified by tables and charts. The analysis highlights the following points:

1. The predominant character of the laryngeal condition: In 41 per cent it was hyperemia; in 14 per cent, edema; in 24 per cent, thickened mucous membrane; in 10 per cent, superficial ulceration; in 7 per cent, pale nodular thickening of the mucous membrane; in 4 per cent

114. Dworetzky, J. P., and Risch, O. C.: Laryngeal Tuberculosis: A Study of Five Hundred Cases of Pulmonary Tuberculosis with a Résumé Based on Twenty-Eight Years of Experience, Ann. Otol., Rhin. & Laryng. **50**:745-761 (Sept.) 1941; abstracted, Arch. Otolaryng. **37**:112 (Jan.) 1943.

115. McConkey, M.: The Value of Cod Liver Oil and Tomato Juice in the Prevention of Laryngeal Tuberculosis, Am. Rev. Tuberc. **47**:284-290 (March) 1943.

116. Heaf, F. R. G.; Hurford, J. V.; Eiser, A., and Franklin, L. M.: Tuberculosis Treated with Promin, Lancet **1**:702-704 (June 5) 1943.

117. Proctor, D. F.: Laryngeal Tuberculosis in the Negro, Am. Rev. Tuberc. **47**:582-595 (June) 1943.

destruction of the deeper tissues. In 20 per cent there was a combination of these conditions.

2. Age and sex of the patients: Sixteen per cent were below the age of 20; 46 per cent were between 20 and 30; 37 per cent were over 30. Forty-six per cent were female and 54 per cent were male.

3. Course of illness: Of the patients 31 per cent improved or got well; 29 per cent showed unsatisfactory progress; 40 per cent died.

4. Extent of the pulmonary disease: Six per cent of the patients with laryngeal tuberculosis had minimal pulmonary tuberculosis; 27 per cent, moderately advanced pulmonary tuberculosis; 67 per cent, far advanced pulmonary tuberculosis.

5. Course of the laryngeal lesion: In 17 per cent it got worse; in 33 per cent it improved or healed; in 49 per cent it remained unchanged.

6. Correlation between the predominant character of the laryngeal lesion and other factors and the prognosis: Edema gave by far the best outlook, particularly in patients below the age of 30. The females had a slightly better prognosis than the males. This was particularly evident in the age group of 20 to 30 years. The patients with superficial ulceration had the worst prognosis. Another unfavorable prognostic factor is youth of the patient with tuberculous laryngitis; 33 per cent of the patients who were below the age of 20 got worse. Reduction of the systemic disease and minimal extent of pulmonary tuberculosis influenced the prognosis favorably.

7. Distribution of types of lesions in age groups: Destructive and edematous lesions occurred comparatively frequently in the patients over the age of 30, while those between 20 and 30 showed a preponderance of chronic thickening of the mucous membrane and in the group below 20 hyperemia and superficial ulceration outweighed the other types of lesions.

8. Treatment: The author advocates complete vocal rest as the basic factor in the therapy of laryngeal tuberculosis. It is interesting to note that he declines to use the electric cautery, which he considers too irritating and traumatizing. Tracheotomy should be kept in mind to relieve laryngeal obstruction and injection into the superior laryngeal nerve for the alleviation of pain.

Brantigan and Hoffman [118] recommended bilateral and partial section of the internal laryngeal nerve for relief of pain in patients with tuberculous laryngitis. They give a detailed description of the surgical technic together with a topographic illustration of the operative field. The surgical interruption of the superior laryngeal nerve is recommended for those few patients in whom pain is not relieved by injection of alcohol into the nerve. The operation was performed on 10 patients with satisfactory and lasting results, as evidenced by the relief of pain and the subsequent improvement in the nutritional condition of the patients.

Engler [119] surveys the literature on the roentgen treatment of laryngeal tuberculosis and then reports his personal experiences with 38 patients. In 8 the condition was cured; in 6, improved; in 8, unchanged; in 16, it became worse. Six case histories are given in detail, and the roentgen dosage scheme is added.

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118. Brantigan, O. C., and Hoffman, R.: Surgical Relief of Pain in Tuberculous Laryngitis, Am. Rev. Tuberc. **47**:596-597 (June) 1943.

119. Engler, C. W.: Roentgen Therapy of Laryngeal Tuberculosis, Ann. Otol., Rhin. & Laryng. **52**:655-665 (Sept.) 1943.

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Abstracts from Current Literature

Ear

RADIUM TREATMENT OF NASOPHARYNGEAL LYMPHOID HYPERTROPHY. ROBERT E. FRICKA and HENRY A. BROWN, South. M. J. **37**:399 (July) 1944.

Seventy-six patients are reported on who received reatment of the nasopharynx with radium for deafess, tinnitus, coryza and severe pharyngitis and who ave been followed up. Those who complained mainly f deafness did not respond as well to therapy as did he others. The younger patients showed the best esponse. Fifty-nine per cent were definitely and permanently improved, 17 per cent temporarily improved nd 24 per cent not helped.

Doses larger than those originally recommended by rowe were tried, with improved results.

LOGAN, Rochester, Minn.
[AM. J. DIS. CHILD.]

STUDIES IN VITAMIN B DEFICIENCY WITH SPECIAL REFERENCE TO MENTAL AND ORAL MANIFESTATIONS. A. GREY CLARKE and F. PRESCOTT, Brit. M. J. **2**:503 (Oct. 23) 1943.

Clarke and Prescott report the results of a study of patients with deficiency of members of the vitamin B mplex, which represented 2 per cent of all patients en by them in an outpatient department. The nervous isorders of all but 1 patient were classified as funcnal. The occurrence of oral lesions due to nicotinic id deficiency associated with symptoms usually conidered as psychoneurotic was a constant finding. All t 2 patients responded to therapy with members of e vitamin B complex. Three patients had relapses fter periods of from two to five months without treatent but responded to further treatment. The study evealed a parallelism between the manifestations of a eficiency of the vitamin B complex and those of psychourosis.

ECHOLS, New Orleans.
[ARCH. NEUROL. & PSYCHIAT.]

OBSERVATIONS ON THE OSMOTIC PRESSURE OF THE ENDOLYMPH. P. ALDRED, C. S. HALLPIKE and A. LEDOUX, J. Physiol. **98**:446, 1940.

The authors studied the osmotic pressure of the endomph and compared it with the osmotic pressures of e perilymph, the cerebrospinal fluid and the blood. n ingenious means of collecting the fluid is described. he round window of a cat's labyrinth is opened, conual suction is applied to the cerebrospinal fluid to ep the field dry and the membrana basilaris is perated with a fine hollow needle to collect the endomph. Serial section postoperatively assured that issner's membrane had not been injured, thus defitely limiting the material to endolymph.

The measurements were made by thermoelectric estiation after the method of Hill as modified by Baldes, d the values obtained expressed the total osmotic essures as equivalent percentages of sodium chloride m. NaCl per hundred cubic centimeters of H_2O) and e as follows: blood, 0.994; cerebrospinal fluid, 1.017; rilymph, 1.046; endolymph, 1.058.

The anatomic and osmotic conditions in the labyrinth are illustrated by a diagram in which are shown the various stages of lymph formation and flow. The endolymph is secreted by the striae vascularis. It is diffused into the perilymph as well as diffused out through the saccus endolymphaticus into surrounding venules and thence into the lateral sinus. The differences in osmotic pressure support their contention of the direction of flow even to the point of excluding the possibility of cerebrospinal fluid entering into the perilymph through the aqueductus cochlea. The latter is explained by the fact that the bony labyrinth is a closed space and by the fact that the osmotic pressure of the perilymph is greater than that of the cerebrospinal fluid. To explain the overcoming of the greater osmotic pressure of the blood, it is suggested that when the endolymph is secreted into the perivascular space around the saccus endolymphaticus, the fluid accumulates, producing a swelling of the perivascular connective tissue, which blocks further excretion of the endolymph, and so reduces the osmotic pressure of the excreted endolymph as to facilitate its absorption into the blood stream.

The work is presented to support the view of a secretory origin of both the cerebrospinal fluid and the labyrinthine fluids and to produce some indication of the relative rate of flow of the endolymph and of the cerebrospinal fluid–perilymph exchange through the cochlear aqueduct. A suggestion is also made concerning the mechanism of the final disposal of the endolymph.

SHUSTER, Philadelphia.

OBSERVATIONS ON THE FUNCTION OF THE ROUND WINDOW. C. S. HALLPIKE and P. SCOTT, J. Physiol. **99**:76, 1940.

According to the resonance hypothesis, the functional value of the round window depends on the lowered resistance to sound waves in a relatively rigid labyrinthine space. Perception of low frequencies is dependent on free movement of the round window membrane. The authors reject this physiologic concept of the round window on the basis of some experimental work on cats' round windows and on histopathologic observations in a patient who came to postmortem examination. In the animals they carefully packed the niche of the round window with plaster of paris and found no difference in the acoustic electrical responses in the animals so treated before and after the occlusion of the round window. In the human subject, who gave normal responses to hearing tests one week before death, they noted post mortem that the round window was almost completely filled with otosclerotic new growth on the interior of the cochlea. This apparently in no way interfered with good hearing during life. In the literature they found reports of 2 cases of occlusion of the round window with fatty tissue and 1 with bone with findings similar to their own. They also quote Pohlman's work in support of their idea. Pohlman expressed the belief that there is a free transfer of acoustic energy through the bony capsule of such magnitude that the effect of sound transferred through the round window becomes insignificant. The work of Hughson and Crowe, who found improvement in hearing by packing

the round window with moist cotton wool and fibrous tissue grafts, the authors explain away by calling the improvement an electrical artefact. They state that this material does not block the window at all and that the improvement in electrical response is due to the graft's better contact with the promontory and moisture. The authors believe with Pohlman that the round window is a pressure stabilizing device rather than one with an acoustic function. They quote their own work on the osmotic pressures of the various fluids concerned in the labyrinth as favoring the hypothesis that the function of the round window is that of a stabilizer of pressure.

SHUSTER, Philadelphia.

OBSERVATIONS ON THE STRUCTURE, DEVELOPMENT AND ELECTRICAL REACTIONS OF THE INTERNAL EAR OF THE SHAKER-1 MOUSE (MUS MUSCULUS). H. GRUNEBERG, C. S. HALLPIKE and A. LEDOUX, Proc. Roy. Soc. London **129**:154 (Aug.) 1940.

A comparative study has been made of the embryology, the anatomy and the electrical reactions of the cochlea in the normal and the shaker mouse (Mus musculus) between the ages of 9 hours and 329 days. Cochlear degeneration in the latter animal is initiated after birth in a fully formed organ, and is associated with marked changes in its electrical reactions. The shaker mouse resembles somewhat the Japanese waltzing mouse. It is characterized by choreic head movements and begins to become deafened soon after birth. Thus the animals made good subjects in which to note histologic changes and auditory changes related to electrical stimulation.

The authors describe the technic of treating the animals at various ages for histologic examination as well as electrical testing of the acoustic apparatus. Excellent histologic illustrations accompany the article. Some facts brought out incidental to the study are of interest. The changes in the stria vascularis, being parallel to the changes in Corti's organ, accentuated the relationship between these structures. It is also brought out that changes in the spiral ganglions are delayed The work also brought into discussion the relative feasibility of two theories of the physiology of hearing, e. g., the "hair-cell theory" (Davis) which assigned to the hair cells of the organ of Corti the function of sound differentiation, and the "membrane theory" (Hallpike; Rawdon-Smith) in which it is supposed that movements of some polarized membrane (Reissner's) and differentiation depend on differences in ionic concentration of the endolymph and the perilymph. The conclusion of the authors' article is as follows:

Histologic examination of the postfetal development of the internal ear in normal and in shaker mice was carried out at periods between nine hours and twelve days after birth.

The normal process of postfetal development appeared to pursue an identical course in both varieties and to be completed in twelve days.

Tests of hearing, measurements of the electrical responses of the cochlea and histologic examination of the internal ear were carried out in normal and in shaker mice at ages between 38 days and 329 days. In all the shaker material deafness was found to be correlated with pathologic changes confined to the scala media complex and with gross reductions of the electrical response. The changes first appear in the stria vascularis and Corti's organ and are progressive with age. Those in the spiral ganglions appear later.

The degenerative process is thus shown to be initiate after birth in a fully differentiated organ. Comparis is made with similar results obtained by van Lennep the Japanese waltzing mouse.

The parallel courses of the loss of the electrical r sponse and the degenerative changes in the stria vasc laris and in the organ of Corti render the resul indecisive with regard to the relative merits of t "membrane" and "hair cell" theories of origin of t response.

A selective loss of the response was found to occ at high frequencies and is correlated with some acce tuation of the degenerative changes in Corti's organ the base of the cochlea. The resemblance of this similar results obtained by Stevens, Davis and Lu in the guinea pig under different experimental conditio is discussed, and the results are not considered to co stitute a decisive contradiction of the membrane h pothesis.

No morphologic abnormalities were found in the ve tibular apparatus of the internal ear. It is therefo supposed that the abnormal head movements are extralabyrinthine origin.

SHUSTER, Philadelphia.

CONSERVATIVE SURGERY IN CHRONIC SUPPURATI OTITIS MEDIA BY THE ENDOAURICULAR ROU MARIO RIUS, An. de oto-rino-laring. d. Urugu **14**:1, 1944.

Rius discusses chronic suppurative otitis media a establishes his indications for surgical intervention the basis of clinical findings.

He groups his cases of suppuration as follows: Fir those of suppuration in the presence of a central p foration of the tympanic membrane. The discharge usually mucoid in character and as a rule does not r quire any operative procedure since it yields readily medical treatment. Some minor procedures may indicated, such as removal of polypi, which is read performed by the endaural route. He stresses the i portance of allergy in cases of this type, and aller treatment must be instituted. In other cases he drai the secretions, removes the polypi and cauterizes t granulations with silver nitrate or trichloroacetic ac Sometimes he uses dehydrating drops of 95 per ce alcohol. He has also employed what he terms a tra tubal displacement treatment, which increases the p meability of the eustachian tube. This is a modificati of the Ashley technic. The latter places a few dro of 0.25 per cent neosynephrine hydrochloride in t middle ear and, with the affected ear upward, perm the solution to drop into the eustachian tube; this establishes free drainage through the tube. The ear then dried and warm air blown through. Internal the patient takes capsules containing ephedrine, phe barbital and atropine in the hope of maintaining t patency of the eustachian tube. However, Rius co not obtain a permanent effect by this procedure, and consequence he made the following modification. H first step was to desensitize the nasal mucosa w trichloroacetic acid. In the second step he attempt to produce desensitization of the mucosa of the stachian orifice by applying a 5 per cent solution silver nitrate once a week for three to five weeks, w an interval of a week between treatments. He th placed about 6 drops of 5 per cent silver nitrate in external ear, placed the head in a position so that t orifice of the tube was below the middle ear, inser a rubber ball attached to a Seigle otoscope and alt

ated pressure and suction until the patient experienced taste of silver nitrate in his throat. Rhus was thus ble to decrease the sensitivity of the mucous membrane, e reflex hypersecretions from the glands and the reflex gioneurotic edema of allergic origin.

He stresses the importance of attempting to close the mpanic membrane and thirdly the preoperative and stoperative use of roentgen therapy, particularly in e presence of polypi.

The second group of cases comprises those in which ere are marginal perforations. In these the suppura- on is either osteitic or associated with cholesteatoma. the osteitic type, with a large perforation, it is almost possible to use conservatism, as is true with the rge perforations accompanying cholesteatoma. How- er, when cholesteatoma occurs with a small perfora- n in the attic, the Lempert procedure is indicated d has produced a definite increase in hearing, restitu- n of the tympanic cavity to an almost normal state d maintenance of the stratified epithelium of the mpanum and of the ciliated cylindric epithelium of e floor of the tympanic cavity in the region of the stachian tube.

PERSKY, Philadelphia.

Pharynx

EATMENT OF VINCENT'S ANGINA WITH SULFATHIAZOLE. WILLIAM W. MANSON and IRWIN T. CRAIG, J. A. M. A. **127**:277 (Feb. 3) 1945.

The authors review in moderate detail some of the evious work and contributions on the treatment of incent's angina. The treatment offered consists of dication with a 0.5 Gm. sulfathiazole tablet every o hours during the day and 2 such tablets every four urs at night, the tablets being dissolved on the tongue. he elevated temperature returned to normal in twenty- ur hours, and the symptoms had almost completely appeared by that time. In spite of the clinical im- ovement, the treatment was continued for a total of enty-two hours except in mild cases, when it was minated at the end of forty-eight hours.

GORDON, Philadelphia.

Larynx

ARYNGECTOMY FOR LARYNGEAL CANCER: REVIEW OF 45 CASES. JULIUS W. MCCALL and W. G. STOVER, Laryngoscope **54**:659 (Dec.) 1944.

McCall and Stover believe that laryngectomy is the eration of choice for carcinoma of the larynx. Even tients with extrinsic carcinoma of the larynx should offered this operative procedure. The disadvantages total laryngectomy—loss of the normal air passage d loss of the speaking voice—are discussed. Neither too serious.

Voice training should be instituted before, as well as er, the operation. The patient must learn to belch by way of the esophagus. The authors discuss the thod of training the esophageal voice. They also cuss their surgical technic in performing laryn- tomy.

The results of 45 cases, with a table summarizing the a on all the cases, are given in detail. Emphasis is ced on their belief that laryngectomy is the operation choice for practically all patients with carcinoma of larynx, and that the results, even in extrinsic cancer the larynx, were encouraging.

HITSCHLER, Philadelphia.

Miscellaneous

STUTTERING: I. A CRITICAL REVIEW AND EVALUATION OF BIOCHEMICAL INVESTIGATIONS. HARRIS HILL, J. Speech Disorders **9**:245, 1944.

This is a review of modern literature on stuttering from the point of view of biochemistry. No corroborative findings have been made with regard to a possible biochemical cause of stuttering. The author believes that if such findings were made they could be demonstrated to be the result rather than the cause of stuttering.

PALMER, Wichita, Kan. [AM. J. DIS. CHILD.]

STUTTERING: II. A REVIEW AND INTEGRATION OF PHYSIOLOGICAL DATA. HARRIS HILL, J. Speech Disorders **9**:289, 1944.

This article is a comprehensive review of physiologic studies of stuttering. The author concludes, after reviewing the evidence, that stuttering is not a self-contained syndrome but is the result of a contraction pattern of shock, startle or surprise in which the subject is thrown out of contact with the situation. These patterns occur when the individual cannot immediately adjust to urgent circumstances, when a response fails or when a situation is evaluated as catastrophic. Such an emotional reaction is universal and requires no explanation on a particular group basis.

PALMER, Wichita, Kan.

POLIOMYELITIS VIRUS IN THE HUMAN OROPHARYNX. HOWARD A. HOWE, HERBERT A. WENNER, DAVID BODIAN and KENNETH F. MAXCY, Proc. Soc. Exper. Biol. & Med. **56**:171 (June) 1944.

Cotton swabs were rubbed on the oropharyngeal and the peritonsillar regions of 14 patients during the first week of poliomyelitis. Each swab was dropped into a test tube with 1 cc. of sterile water and stored on solid carbon dioxide. Elution was accomplished by placing the swab in phosphate buffer at p_H 8, and the fluid was squeezed out of this cotton by placing it in a syringe. After adjusting the preparation to p_H 6 and treating it with ether, which was later removed, injections were made intracerebrally into 14 rhesus monkeys weighing 8 to 10 pounds (3.6 to 4.5 Kg.) each. Typical poliomyelitis was produced in 7 of the animals, and paralysis resulted in 6. Microscopic studies showed the characteristic lesion. The positive results were equally distributed among the paralytic and the nonparalytic subjects.

HANSEN, Galveston, Texas.
[AM. J. DIS. CHILD.]

THE EFFECTS OF NASALITY ON ORAL COMMUNICATION. GEORGE M. GLASGOW, Quart. J. Speech **10**:337, 1944.

Two hundred and twenty-six high school girls listened to four specimens of descriptive prose and four specimens of lyric poetry recorded in both normal and hyperrhinolalic speech. Nasality of the recording voice reduced the girls' comprehension of spoken descriptive prose by 13.4 per cent and their comprehension of lyric poetry by 15.8 per cent. The harmful effect of nasality on comprehension as studied statistically was a true, representative effect. Vocal quality obviously carries large thought complexes. Speakers who wish to get maximum efficiency of language should particularly avoid nasality.

PALMER, Wichita, Kan.

Directory of Otolaryngologic Societies *

NATIONAL

All meetings, except that of the American Academy of Ophthalmology and Otolaryngology, have been canceled.

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Louis H. Clerf, 1530 Locust St., Philadelphia.
Secretary: Dr. Fletcher D. Woodward, 104 E. Market St., Charlottesville, Va.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Gordon B. New, Mayo Clinic, Rochester, Minn.
President-Elect: Dr. Alan C. Woods, Johns Hopkins Hospital, Baltimore 5.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100–1st Ave. Bldg., Rochester, Minn.

American Broncho-Esophagological Association

President: Dr. Carlos E. Pitkin, Carnegie Medical Bldg., Cleveland.
Secretary: Dr. Paul Holinger, 700 N. Michigan Ave., Chicago 11.

American Laryngological Association

President: Dr. Harold I. Lillie, Mayo Clinic, Rochester, Minn.
Secretary: Dr. Arthur W. Proetz, Beaumont Bldg., St. Louis.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Albert C. Furstenberg, University Hospital, Ann Arbor, Mich.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.

SECTIONS:

Eastern.—Chairman: Dr. Oram R. Kline, 414 Cooper St., Camden, N. J.
Southern.—Chairman: Dr. Verling K. Hart, 106 W. 7th St., Charlotte, N. C.
Middle.—Chairman: Dr. Carl H. McCasky, 608 Guaranty Bldg., Indianapolis.
Western.—Chairman: Dr. Aubrey G. Rawlins, 384 Post St., San Francisco.

American Otological Society

President: Dr. Gordon Berry, 36 Pleasant St., Worcester, Mass.
Secretary: Dr. Isidore Friesner, 101 E. 73d St., New York.

American Otorhinologic Society for the Advancement of Plastic and Reconstructive Surgery, Inc.

President: Dr. Morris S. Bender, 121 E. 60th St., New York.
Secretary: Dr. Jacob Daley, 104 E. 40th St., New York 16.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

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